

# ART. 21. SCOLECODONTS OF THE DELAWARE LIMESTONE, DEVONIAN OF OHIO AND ONTARIO

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Discrete scolecodonts are plentiful in the Delaware limestone of Devonian age and all localities examined produced scores of specimens. This study does not by any means include all the forms that probably occur. Since the matrix is limestone and subject to some agitation at the time of deposition, complete assemblages of jaws were not found. Also the jaws are secured from the limestone by treatment with acid, which tends to separate them. Occasionally a maxilla I or II was found with a smaller jaw adhering to it in possible articulation.

During the past few years a number of paleontologists, Kielan-Jaworowska (1961), Kozłowski (1956), Lang (1949), have erected new genera for articulated scolecodonts or assemblages in complete disregard for the International Rules on Zoological Nomenclature. Due to certain problems and disagreements conodont specialists are apparently having difficulties in working out a classification and nomenclature for their disjunct specimens and assemblages. A dual nomenclature has been the result. It may be that scolecodont workers have followed unwittingly along this rather dubious path of unsettled issues and for this reason have erected unnecessarily an illegal dual nomenclature. The jaw apparatus of modern and fossil polychaete is relatively simple. A scolecodont jaw assemblage usually contains a jaw of a well established fossil genus based on an existing genus. Thus there seems to be little reason for new genera for known forms and a dual nomenclature in scolecodont classification. In this paper the genus *Paulinites*, Lang, 1947, is placed under the genus *Nereidavus*, Grinnell, 1877, and the genera *Vistulella* and *Mochtyella*, Kielan-Jaworowska, 1961, are included under the genus *Staurocephalites*, Hinde, 1879.

Kielan-Jaworowska has taken exception in a paper (1961) to the use of the word "fossa" for the muscle cavity of an annelid tooth and has introduced the term "pulp cavity." This term is used in the description of the vertebrate tooth, which is in no way homologous to the annelid tooth. The use of the word "pulp" implies that it is the same material found in the cavity of the vertebrate tooth. Anatomically the word "fossa" (Latin: ditch or trench) is in common use. Webster's Unabridged Dictionary defines fossa (anat.) as a pit, groove, cavity or depression of greater or less depth. The Century Dictionary defines fossa as any depression, pit or hollow in a structure, specified by a qualifying term. Zoologically, a fossa is described as a depression or a deep pit in the hard integument of an animal, often opening into a cavity and serving for the point of attachment of an organ. More than 40 examples are given for the use of the word. It may be that the term "pulp cavity" was adapted from conodont terminology which is also of a questionable nature.

## Genus ARABELLITES Hinde, 1879

*Arabellites goniocercus* sp. nov.

Maxilla I. Plate 1, Fig. 1

The jaw is elongate, suboblong in outline, and angular posteriorly. The figured specimen measures 0.72 mm. in length. Along the straight inner margin, which is about one-third the length of the jaw, a series of seven or eight small, sharp-pointed, backward-directed denticles extends to the posterior end. The denticles are nearly uniform in size. About two-thirds of the jaw consists of a wide, hooked fang that narrows abruptly to a sharp point. The posterior end is wide and truncate. Along the outer margin a narrow shank-like projection is slightly hooked at the anterior end and forms a small, rounded notch. A wide, shallow fossa occupies about one-third of the posterior area of the jaw. The margins of the fossa are rounded and slightly thickened.

There is a general similarity between this form and a number of other species. *Arabellites contractus* Hinde (1882), *Arabellites rectidens* Eller (1940) and *Arabellites hamiltonensis* (Stauffer) (1941) are similar except for the size of the fossa and fang and the presence of the shank on the outer margin. Locality: Goderich, Ontario.

*Arabellites comis* Eller

Maxilla I. Plate 1, Fig. 2, 3, 4

*Arabellites comis* Eller, 1938. Annals of the Carnegie Museum, v. 27, p. 277, pl. 28, fig. 9.

*Arabellites comis* Stauffer, 1939. Journal of paleontology, v. 13, no. 5, p. 501-502, pl. 58, fig. 21, 22, 28.

*Arabellites comis* Sylvester, 1959. Journal of paleontology, v. 33, no. 1, p. 40, pl. 5, fig. 1-4.

Several specimens bear on the obliquely truncate posterior end a small pointed projection. This seems to occur on specimens whose denticles are larger and not so pointed. The figured specimens measure about 0.67 mm. in length. Locality: St. Mary's, Ontario; Goderich, Ontario.

## Genus NEREIDAVUS Grinnell, 1877

*Nereidavus forcicarinatus* sp. nov.

Maxilla I. Plate 1, Fig. 5, 6

The jaw is narrow and elongate and the figured specimen measures 0.67 mm. in length and 0.2 mm. at the widest part. Along the slightly curved inner margin a series of very minute, nearly equal-sized denticles extends for a short distance at the central part of the jaw. A large, hooked, sharp-pointed fang is directed backward. Both the denticles and the fang are nearly oblique to the underside of the jaw. The posterior third of the jaw is occupied by a deep rectangular-shaped fossa. The margins of the fossa are thickened and rounded and the inner margin is extended to form a straight-sided flange that is slightly oblique. The flange is also slightly concave. A convex area is present in the lower half of the fossa. The surface of the jaw adjacent to the

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denticles is concave. When observed from the side opposite the fossa, a heavy ridge or keel that is forked is discernible at the posterior end near the outer margin. This structure is not reflected on the other side. The posterior end of the jaw is truncate except for a small notch.

*Nereidavus forcicarinatus* is a typical form of the genus *Nereidavus*. It is similar to a number of species but differs in details. Usually the denticles of *Nereidavus* species extend from the fang nearly to the posterior extremity. *Nereidavus forcicarinatus* seems to have only a few denticles located at the mid-area of the inner margin. The fossa and the area opposite on the under side of the jaw are not comparable with other forms. Locality: Delaware, Ohio.

*Nereidavus incrassatus* sp. nov.

Maxilla I. Plate 1, Fig. 7, 8, 11, 12, 13

Measurements of the narrow, elongate figured specimens range from 0.92 mm. to 1.92 mm. in length. Along the nearly straight inner margin a series of 20 to 25 small, mostly rounded denticles extends nearly the full length of the jaw. Very minute denticles are actually present on or at the base of the fang. They increase gradually in size posteriorly. A large, thickened fang is curved backward and is slightly oblique to the surface of the jaw. The outer margin is slightly irregular in outline but in general it is parallel to the inner margin. The posterior margin is indented by a large, angular bight. A rather narrow, shallow fossa occupies about one-fourth the length of the jaw. The margins of the fossa are thickened and rounded, especially the anterior margin, which forms a ridge and extends to the outer margin as a small flange or spur. Adjacent to the fossa the inner margin is extended to form a flattened to slightly concave flange. The surface of the jaw is generally convex while the opposite surface is usually irregularly concave.

*Nereidavus incrassatus* resembles *Nereidavus harbisonae* Eller (1941) and *Nereidavus paranaensis* (Lange) (1947). They differ in the width of the jaw, the character and arrangement of the denticles, the shape of the fossa and the presence of a flange on the inner margin. More closely related to *Nereidavus incrassatus* is *Nereidavus ontarioensis* Stauffer (1939). The size of the fang, the shape of the fossa, and details of the posterior end are dissimilar. Locality: Delaware, Ohio; St. Mary's, Ontario.

*Nereidavus hastatus* sp. nov.

Maxilla I. Plate 1, Fig. 9, 10

The jaw is small and elongate and the figured specimen measures 0.52 mm. in length. There is only a suggestion of denticles on the inner margin near the posterior end. It is possible that the jaw is completely void of teeth. The spear-shaped fang points in a forward direction. An irregularly shaped fossa occupies about one-fourth of the jaw. The margins of the fossa are thickened and rounded. A straight-sided flange slightly oblique to the surface is present on the inner margin adjacent to the fossa. The surface of the jaw is irregular while the opposite surface is convex except for a depressed area at the posterior end. The truncate posterior margin is very slightly indented and oblique.

On some specimens of *Nereidavus invisibilis* Eller (1940) the denticles seem to be missing or are only stubs. In other scolecodont forms it has been noticed

that the teeth decrease in size and may gradually disappear and form a sharp ridge. At first it was questioned whether this form should be placed in the genus *Nereidavus* because of the apparent lack of denticles. The elongate form, the fossa, and the posterior end are, however, typical for the genus *Nereidavus*. There is a possibility that *Eunicites angulatus* Eller (1938) (1955) belongs to the genus *Nereidavus* since the general shape is similar and the fossa and posterior region resemble these structures in *Nereidavus hastatus*. Locality: St. Mary's, Ontario.

*Nereidavus incomptus* sp. nov.

Maxilla I. Plate I, Fig. 14, 15

This narrow and elongate jaw is represented by a number of well preserved specimens, all about the same size. The figured jaw measures 0.82 mm. in length. Along the inner margin a series of very minute denticles is present. In the figures of the jaw the denticles are shown actually larger than they are since it was impossible to draw them any smaller. Some specimens seemed to be unadorned with any teeth at all while others had mere suggestions. Usually the denticles are located at the central part of the jaw. A long, thin fang is hooked backward and is slightly oblique to the side of the jaw. A large, deep fossa occupies about one-fourth of the jaw. The margins of the fossa are thickened and rounded. The anterior margin of the fossa is extended to the outer margin to form a small protuberance. A long, fairly wide flange is present adjacent to the fossa on the inner margin. The surface of the jaw is irregular with a deep concave area at the posterior end. The opposite surface is convex. The posterior end is truncate or slightly indented.

*Nereidavus incomptus* is similar to *Nereidavus harbisonae* Eller (1941). There is a difference in the size of the denticles and the fossa and the presence of a protuberance on the outer margin. It is possible that *Nereidavus incomptus* is the right paired jaw of *Nereidavus incrassatus*, Plate I, Fig. 7, 8, 11, 12, 13. Locality: Delaware, Ohio.

*Nereidavus harbisonae* Eller

Maxilla II

*Nereidavus harbisonae* Eller, 1941. Annals of the Carnegie Museum, v. 28, p. 325, 326, pl. 37, fig. 1, 2, 4, 5.

*Nereidavus harbisonae* Sylvester, 1959. Journal of paleontology, v. 33, p. 47, pl. 6, fig. 21, 22, 23, 24.

This form is fairly common and was found at a number of localities of the Delaware Limestone.

DRILONEREISITES gen. nov.

Jaws of this genus are characterized by a large fang or primary denticle as long or longer than the jaw proper. Along the inner margin, often on an elevated ridge, a series of small to medium-sized denticles, usually nearly uniform in size, extend to or nearly to the posterior extremity. A round to elongate fossa is present. Adjacent to the denticles and forming the inner



margin of the fossa is a narrow to wide shank which is sub-rectangular in shape. Its margin is straight or slightly rounded. The posterior end of the jaw is truncate and the margin is usually incurved.

Genotype, *Drilonereisites longicusculus* sp. nov.

Jaws of this kind were originally included under the genus *Arabellites*. Hinde (1879) in erecting the genus *Arabellites* stated the following: "I propose to include in this genus jaws of widely different form, which have a general resemblance to the existing genus *Arabellites* Grube. Jaws with an extremely prominent anterior hook, and a row of smaller teeth on a wide base." A number of closely related species described by Hinde, Stauffer, and Eller under the genera *Arabellites* and *Protarabellites* are so unlike any forms found under these genera that a new genus seems advisable. *Drilonereisites* is based on the existing genus *Drilonereis* Claparède which has an extremely long fang or hook and a rather small base. Stauffer (1933) erected a genus *Protarabellites* and described forms that will be included under *Drilonereisites*. Stauffer's genotype, *Protarabellites humilis* is a completely different type of jaw than those to be placed under *Drilonereisites*. *Arabellites spicatus* var. *contractus* Hinde (1880), *Arabellites contractus* Hinde (1882), *Protarabellites excelsus* Stauffer (1939), *Protarabellites hamiltonensis* Stauffer (1939), *Arabellites hamiltonensis* (Stauffer) (1941), *Arabellites rectidens* Eller (1940), *Arabellites rectidens* ? Eller (1945), *Arabellites arrectus* Eller (1955), and *Drilonereisites longicusculus*, pl. 3, fig. 1, 2, 3, and *Drilonereisites gracillimus*, pl. 1, fig. 16, 17, described in this paper will be included under the genus *Drilonereisites*.

*Drilonereisites longicusculus* sp. nov.

Maxilla I. Plate 3, Fig. 1, 2, 3, 4

The jaw is narrowly elongate and the figured specimens measure from 0.75 mm. to 0.92 mm. in length. A series of about 14 minute, conical denticles is located on a narrow, elevated ridge which is parallel to the inner margin. The denticles are nearly the same size and extend only partway to the posterior end. About two-thirds of the jaw consists of a rather long, heavy, sharp-pointed, hooked fang. From the fang the outer margin is incurved slightly to the posterior. A small round fossa is present on one side. The anterior and inner margins of the fossa are in the form of a rounded ridge while the outer margin is extended into a wide shank. The underside of the jaw is irregularly convex and concave while the upperside does not reflect exactly the underside but is mostly convex. The posterior end of the jaw is slightly obliquely truncate with an irregularly-curved margin.

Hinde (1882) described two species, *Arabellites spicatus* var. *contractus* and *Arabellites contractus* Hinde (1882) which resemble *Drilonereisites longicusculus* except for the size and length of the fang and the character of the denticles and fossa. The fang of *Protarabellites excelsus* Stauffer (1939) resembles that of *Drilonereisites longicusculus* but differs in the size of the denticles and the width of the jaw. *Protarabellites hamiltonensis* Stauffer (1939) and *Arabellites hamiltonensis* (Stauffer) (1941) do not have as long a fang but are similar to *Drilonereisites longicusculus* in the arrangement of the denticles and the shape of the shank. There is a similarity between *Drilonereisites*

*longicusculus* and *Arabellites rectidens* ? Eller (1945) and *Arabellites arrectus* Eller (1955) in the size and character of the fang and the general shape of the jaw. They differ in the size of the teeth and the fossa. Locality: Delaware, Ohio; Benmiller, Ontario.

*Drilonereisites gracillimus* sp. nov.

Maxilla I. Plate 1, Fig. 16, 17

This jaw is elongate and very slender. The figured specimen measures 0.67 mm. in length and 0.19 mm. in width. Only six very small, sharp-pointed, backward-directed denticles are present on the inner margin. They are located at the posterior area of the jaw but do not extend to the end. Most of the jaw consists of a large, hooked, angular fang which is slightly oblique to the underside. Less than one-third of the jaw is taken up by a deep, irregularly shaped fossa. It is oval at the anterior and narrows to a groove at the posterior. The margins of the fossa are thickened and rounded. An irregularly shaped flange is present on the outer margin opposite the fossa. The posterior end is angular and slightly notched.

*Drilonereisites gracillimus* is similar in a general way to several other species. It closely resembles *Drilonereisites longicusculus*, pl. 3, fig. 1, 2, 3, except that it is not as wide proportionately in the anterior part. Locality: Benmiller, Ontario.

Genus *ILDRAITES* Eller, 1936

*Ildraites incredibilis* sp. nov.

Maxilla I. Plate 1, Fig. 18

The jaw is incredibly large and except for the shank is fairly narrow for its length. It is possible that a small portion of the posterior end of the jaw is missing. The figured specimen measures 2.57 mm. in length. Possibly it would measure near three millimeters if complete. Along the inner margin a series of seven large, blunt, conical, backward-directed denticles extends the full length of the jaw. The first denticle is rounded and hardly has the appearance of a tooth in some specimens. The remaining denticles decrease in size gradually to the posterior. A large blunt fang points in a forward direction. On smaller specimens the fang is more sharply pointed. The fang and denticles are only slightly oblique to the surface of the jaw. On the outer margin a wide, deep, crescent-shaped bight forms with the fang a long, narrow, slightly curved shank. If the shank were not broken it is estimated that the figured specimen would be nearly two millimeters wide. Except for the fang a shallow fossa occupies most of the side of the jaw and shank. The margins of the fossa are thickened and rounded. On the shank the margin is flattened and becomes wide toward the end.

*Ildraites incredibilis* is unlike other species of *Ildraites* due to the arrangement and length of the shank. Usually the shank is fairly short and points in a posterior direction. In most species of *Ildraites* the fang and the denticles are oblique or nearly perpendicular to the under surface of the jaw. In *Ildraites incredibilis* they are only slightly so. Locality: Goderich, Ontario.

*Ildraites insignis* sp. nov.

Maxilla I. Plate 1, Fig. 19, 20

The jaw is wide and the figured specimen measures 0.70 mm. in length and 0.32 mm. in width. Adjacent to the inner margin a series of six fairly large, conical, sharp-pointed, backward-directed denticles extends to the posterior end. The fang is short, wide, blunt, well-hooked, and oblique to the under side of the jaw. A wide, shallow bight present on the outer margin emphasizes a small but wide shank. The fossa is large, wide, and shallow with a convex area in the center. The margins of the fossa are thickened and rounded especially along the inner margin. A concave area is present adjacent to the denticles. The posterior end of the jaw is narrow and slightly curved. A knob-like mark is present near the outer margin at the posterior end.

There is a general resemblance between *Ildraites insignis* and a number of species described under this genus. *Ildraites camurus* Eller (1940, 1942) and *Ildraites anatinus* (Stauffer) (1939) have characters similar to *Ildraites insignis*. They differ in the number of denticles and the width of the jaw. Hinde (1882) described a species *Arabellites spicatus* Hinde that is like *Ildraites insignis* except for the number of denticles and the shape of the bight. Locality: St. Mary's, Ontario.

*Ildraites invalidus* sp. nov.

Maxilla I. Plate 1, Fig. 21, 22

The jaw is small and wide, and tapers abruptly to a narrow, slightly curved posterior end. The figured specimen measures 0.52 mm. in length and 0.27 mm. in width. Along the inner margin a series of eight or nine rather large, conical, sharp-pointed, backward-directed denticles extends to the posterior end. From the anterior the denticles gradually become oblique to the under surface of the jaw. Only a short space is present between the denticles and the small, sharp-pointed, slightly hooked fang. The outer margin is nearly straight or slightly incurved to about the mid-area where it forms a short, wide, heavy shank. A small, narrow, not very strong bight emphasizes the width and shortness of the shank. The fossa is narrow and long and occupies about one-half the surface of the jaw. The margins of the fossa are slightly thickened and rounded. The side of the jaw is concave adjacent to the denticles but highly convex at the outer side. These contours are reflected on the opposite surface of the jaw.

There is a similarity between *Ildraites invalidus* and *Ildraites bowenensis* Eller (1941) and especially *Ildraites patulus* Eller (1942). These species all have the small space between the denticles and the fang. *Ildraites invalidus* differs from these forms in the shape and size of the fossa and the character of the bight. Locality: Cheapside, Ontario.

*Ildraites unexpectatus* sp. nov.

Maxilla I. Plate 1, Fig. 24, 25, 26

The jaw is narrow and the figured specimen measures 0.70 mm. in length and 0.27 mm. in width. Along the slightly curved inner margin a series of eight or nine conical, sharp-pointed, backward-directed denticles extends the full length of the jaw. The first denticle is minute and it is followed by

teeth that are unexpectedly large in comparison to the size of the jaw. They decrease in size gradually to the posterior end. A large, conical, sharp-pointed, fang is well hooked. Beginning at the anterior the denticles gradually become oblique to the side of the jaw and toward the posterior may be perpendicular. The outer margin incurves slightly and then forms a small, angular shank. A small, narrow, rounded bight emphasizes the size and character of the shank and the narrowness of the posterior end. Most of the surface of the jaw is occupied by a shallow fossa. The margins of the fossa are thickened and rounded except in the region of the shank. The surface of the jaw is concave adjacent to the denticles and irregularly convex and concave at the outer half of the jaw. This configuration is reflected in the fossa and shank on the opposite side of the jaw.

*Ildraites fritzae* Eller (1942) is similar to *Ildraites unexpectatus* except that the latter is not so long, the bight deeper, and it has one small denticle following the fang instead of two. Locality: Delaware, Ohio.

*Ildraites anatinus* (Stauffer)

Maxilla I

*Arabellites anatinus* Stauffer, 1939. Journal of paleontology, v. 13, p. 501, pl. 58, fig. 40, 41, 42, 50.

*Ildraites anatinus* Eller, 1941. Annals of the Carnegie Museum, v. 28, p. 329, 330, pl. 37, fig. 17, 18.

*Ildraites anatinus* (Stauffer) seems to be common and widespread in middle Devonian rocks. It was found at several localities in the Delaware Limestone.

Genus LUMBRICONEREITES Ehler, 1868

*Lumbriconereites jugosus* sp. nov.

Maxilla I, II. Plate 2, Fig. 1, 2, 3, 4, 12

Although the right and left jaws of Maxilla I are asymmetrical and not in an articulated position it is probable that they belong to the same species. The left and right jaws are elongate and the figured specimens measure about 1.35 mm. in length. On the left jaw a series of 15 conical, sharp-pointed, backward-directed denticles extends the full length of the jaw. The first three denticles are medium in size. From the fourth denticle, which is large, the teeth decrease in size gradually to the posterior end. The fang is long, thin, sharp-pointed and only slightly hooked. Most of the denticles are in an oblique position to the under surface of the jaw. A fairly large, rounded shank is present on the inner margin. Posterior to the shank the inner margin incurves slightly and then becomes straight to the posterior end. On the outer margin a very small shank-like projection is found opposite the third denticle of the jaw. It forms a small notch or bight anteriorly. From this flange the outer margin is nearly straight to the posterior end. A large deep fossa occupies nearly all the surface of the jaw. The margins of the fossa are slightly thickened and rounded. The denticles of the right jaw are the same in number, but instead of pointing in a backward direction they are nearly perpendicular to the under surface. The outer margin of the right



jaw curves gently to about the anterior third of the jaw where it abruptly forms a fairly wide, straight-sided flange that extends to the posterior end. The flange determines the shape of the small bight at its anterior end. On the irregularly curved inner margin a narrow, rounded flange is present at about the anterior third of the jaw. A long, narrow, deep fossa is present on the surface.

Adhering or yoked to the anterior margin of both left and right jaws of maxilla I are specimens of maxilla II. It is possible that these jaws are about in natural position or articulation. The posterior extremity of each jaw fits in the notch or bight at the anterior end of the flange on maxilla I. The left jaw of maxilla II is subtriangular in shape and measures about 0.55 mm. in length. A series of 13 or 14 conical, sharp-pointed, backward-directed denticles extends the full length of the well arched jaw. The first five denticles are large and the remaining ones become small rather abruptly. The inner margin is irregularly curved to a small flange where it incurves gently to the posterior end. This incurved margin or bight fits the curvature of the outer, anterior margin of maxilla I. A large, deep fossa occupies most of the one side of the jaw. The margins of the fossa are slightly thickened and rounded. The right jaw, maxilla II, is subtriangular in shape and the figured specimen measures 0.70 mm. in length. A series of 10 conical, sharp-pointed denticles extends nearly to the acute posterior end. The denticles point mostly straight forward and are not oblique to the surface of the jaw. They decrease in size gradually to the posterior. The inner margin is irregularly curved from the anterior end to form a small shank. Posterior to the shank the margin incurves gently in shape to form a shallow bight. The margin of the bight is in articulation with the anterior outer margin of maxilla I. The outer margin incurves gently and forms a wide, rounded shank. The remainder of the outer margin is irregularly curved to the acute posterior extremity. A large, deep fossa occupies nearly all one surface of the jaw. The margins of the fossa are thickened and rounded.

Maxilla I and II of *Lumbriconereites jugosus* were first considered to be *Lumbriconereites cooperi* Eller (1938), maxilla I, and *Paleoenonites alpenaensis* (Eller) (1938), (1955), maxilla II, respectively. There are, on closer examination, a number of differences. The denticles of *Lumbriconereites jugosus* extend to the posterior end while in *Lumbriconereites cooperi* they do not. The flange on the inner margin of *Lumbriconereites jugosus* is more rounded and in a more anterior position. Also the bight is not so pronounced. The left jaw, maxilla I, of *Lumbriconereites jugosus* differs considerably from the left jaw of *Lumbriconereites cooperi* Eller (1938). Again the denticles of *Lumbriconereites jugosus* extend much farther to the posterior than *Lumbriconereites cooperi* Eller. The greatest difference is the presence of a wide flange on the outer margin of the right jaw of *Lumbriconereites jugosus*. This character does not seem to be present on other species of *Lumbriconereites* except for *Lumbriconereites tuberosus* Eller (1945). The left and right jaws of maxilla II are similar to a number of forms described under the genus *Paleoenonites*. They do not correspond very closely to the jaws of maxilla II of *Paleoenonites alpenaensis* (Eller) (1938) (1955). Locality: St. Mary's, Ontario.

*Lumbriconereites labiosus* sp. nov.

Maxilla I. Plate 2, Fig. 5, 6

Measurements of the length of the figured specimens and duplicates are 0.87 mm. The jaw is wide and most specimens are nearly half as broad as they are long. A series of 12 conical, sharp-pointed, backward-directed denticles extends the full length of the jaw. The denticles are slightly smaller anteriorly than in the center area of the jaw. From the middle they decrease gradually in size to the truncate posterior extremity. The fang is thin and sharp-pointed and is directed in a forward position. The inner margin in-curves from the anterior to form a small bight with a very wide angular shank that extends to the posterior end. The outer margin is broadly curved and does not form a typical shank. A long, very narrow fossa extends the full length of the jaw. The broad large-lipped areas adjacent to the fossa are convex while the opposite side is concave.

*Lumbriconereites labiosus* reminds one of *Lumbriconereites curvus* Eller (1945) in general characteristics. Neither form resembles other species of *Lumbriconereites* very closely. *Lumbriconereites labiosus* differs from *Lumbriconereites curvus* in the shape and length of the flange on the inner margin and in the length and width of the fossa. There is also a difference in the shape of the outer margin and the direction in which the fang is pointed. Locality: Cheapside, Ontario.

*Lumbriconereites flexuosus* sp. nov.

Maxilla I. Plate 2, Fig. 7, 8

The jaw is narrow and full of turns and the figured specimen measures 0.60 mm. in length. A series of 10 conical, sharp-pointed, backward-directed denticles extends nearly to the posterior end. The denticles are fairly uniform in size and become smaller only near the posterior. The large conical fang points directly backward while the remaining denticles are slightly oblique to the under surface of the jaw. Adjacent to the fang the inner margin curves inward to form a well defined shank. Posterior to the shank the margin curves in a crescent-shaped bight and then becomes straight to the posterior end. On the outer margin at the anterior end a very prominent shank points in a forward direction. From the shank to the posterior end the margin is nearly straight and parallel with the inner margin. A deep fossa occupies most of one side of the jaw. The margins of the fossa are thickened and rounded.

*Lumbriconereites flexuosus* is similar to a number of forms. This is especially true of *Lumbriconereites cooperi* Eller (1938), figures 7 and 8. *Lumbriconereites flexuosus* differs from other species in its angularity and the shape and prominence of the shanks. Locality: Cheapside, Ontario.

*Lumbriconereites latifrons* sp. nov.

Maxilla I. Plate 2, Fig. 9, 10, 13

The jaw is broad-fronted, angular and subrectangular in shape. The figured specimens measure 0.77 mm. in length and 0.32 mm. in width at the anterior end. A series of 10 conical, sharp-pointed denticles extends the full length of the jaw. They are fairly uniform in size except for the posterior tooth, which is minute. The small fang and the following two denticles are

directed slightly forward while the remaining ones point in a backward direction. The obliquity of the denticles including the fang is nearly to the horizontal. The anterior margin is nearly straight, measures 0.40 mm. in width, and forms a small shank with the nearly straight outer margin. The inner margin incurves slightly and then becomes abruptly indented to form a deep crescent-shaped bight. A fossa occupies nearly the complete surface of the jaw. It is wide and shallow anteriorly but becomes narrow and deep at the posterior half. The margins of the fossa are slightly thickened and rounded. The surfaces are irregular in contour.

The angularity and straightness of the margins of *Lumbriconereites latifrons* is not found in other forms of this genus. Locality: Delaware, Ohio.

*Lumbriconereites cooperi* Eller

Maxilla I

*Lumbriconereites cooperi* Eller, 1938. Annals of the Carnegie Museum, v. 27, p. 275-277, pl. 28, fig. 5, 6.

*Lumbriconereites cooperi* Sylvester, 1959. Journal of paleontology, v. 33, p. 45, 46, pl. 6, fig. 9, 10, 11, 12.

*Lumbriconereites cooperi* ? Eller, 1961. Annals of the Carnegie Museum, v. 36, p. 29, pl. 1, fig. 1, 2, 3.

*Lumbriconereites cooperi* Eller is probably the most common form of the Delaware Limestone. This is also true of other middle Devonian formations.

Genus LEODICITES Eller, 1940

*Leodicites* sp. indet.

Maxilla II. Plate 1, Fig. 23

A number of specimens of this sort were found at several localities. Unfortunately all were broken or were not well preserved. The bight and the shank of the figured specimen is probably distorted. Locality, Delaware, Ohio.

*Leodicites fluctuosus* sp. nov.

Maxilla II. Plate 3, Fig. 11

The jaw is large, wide and subrectangular in shape. The figured specimen measures 1.7 mm. in length and 0.82 mm. in width. Along the curved inner margin a series of 10 blunt, large, triangular denticles extends nearly to the posterior extremity. The first denticle or fang is large and is pointed slightly forward. It is followed by backward-directed denticles that decrease gradually in size posteriorly. From the curved anterior the nearly straight outer margin extends nearly to a point opposite the posterior end of the inner margin to form a blunt shank. A deep, irregularly shaped bight emphasizes the length of the shank. A subtriangularly shaped fossa is present on the surface of the jaw. The outer and posterior margins of the fossa are wide and full of waves or sculptured while the remaining margin is wide and flat. The surfaces of the jaw are irregularly convex and concave.

*Leodicites fluctuosus* cannot be compared very closely to other forms due to the length of the outer margin and shank. Locality: Goderich, Ontario.

*Leodicites inordinatus* sp. nov.

Maxilla II. Plate 2, Fig. 14, 15, 16, 21

In outline the jaw is narrowly subtriangular with irregularly curved margins. The figured specimens measure from 0.65 mm. to 0.75 mm. in length. A series of 10 irregular, backward-directed, triangular denticles extends nearly to the posterior end of the jaw. The first denticle is small, hooked and adheres closely to the second larger denticle. In some specimens both the third and fourth denticles may be minute while in other specimens only the third denticle is small. The next denticle is usually fairly large and is perpendicular to the margin of the jaw. The remaining denticles decrease gradually in size to the posterior. Most of the denticles are slightly oblique to the surface of the jaw. An angularly shaped bight is present on the outer margin and it forms, with the anterior margin, a narrow, fairly straight shank. The anterior margin is irregularly rounded and the posterior end is obtuse. The surfaces of the jaw are irregularly convex and concave. A narrow, deep fossa occupies most of one surface of the jaw. The margins of the fossa are slightly thickened and rounded.

There is a general similarity between *Leodicites acclivis* Eller (1942), *Leodicites buris* Eller (1945) and *Leodicites inordinatus*. The species differ in the arrangement of the denticles and the irregularity of the margins. Locality: St. Mary's, Ontario; Goderich, Ontario.

*Leodicites inornatus* sp. nov.

Maxilla II. Plate 2, Fig. 17

The jaw is small, elongate and narrow. The figured specimen measures 0.35 mm. in length and 0.13 mm. in width. A series of nine conical, sharp-pointed, backward-directed denticles extends nearly to the acute posterior end. The first denticle is large and well hooked. The remaining denticles are large in comparison to the size of the jaw. They decrease gradually in size to the posterior. The outer margin curves gently to a small, narrow shank which in turn forms a small crescent-shaped bight. A narrow maxillary muscle fossa occupies about one-half the posterior end of the jaw. The margins of the fossa are rounded and slightly thickened. The surfaces are smooth and unadorned.

The narrowness of the jaw and the position of the shank make this form different from other species. There is a slight resemblance between *Eunicites cristatus* Hinde (1882) and *Leodicites inornatus*. Locality: St. Mary's, Ontario.

*Leodicites finitimus* sp. nov.

Maxilla II. Plate 2, Fig. 18, 19

In outline the jaw is narrow and elongate. The figured specimen measures 0.52 mm. in length and about 0.07 mm. in width at the posterior half. A series of 11 sharp-pointed, rectangular, backward-directed denticles extends nearly to the acute posterior extremity. The first two denticles are small and the third is large. The remaining denticles begin with a small one and gradually increase in size to about the mid-area and then decrease in size to the posterior end of the jaw. The denticles are oblique to the surface of the jaw. The rounded anterior margin becomes straight to form a thin, sharp-pointed shank. A crescent-shaped bight is present on the inner margin.



The outer margin curves from the anterior to form a small, sharp-pointed shank and then becomes straight. A deep, narrow fossa extends nearly the full length of the jaw. The margins of the fossa are slightly thickened and rounded.

*Leodicites fnitimus* borders upon in a general way a number of other forms. It differs in the arrangement of the denticles and the shape and position of the shanks. *Leodicites crassimarginatus* Eller (1961) is similar in outline. Locality: St. Mary's, Ontario.

*Leodicites heteropsis* sp. nov.

Maxilla II. Plate 2, Fig. 20

The jaw is narrow, elongate and subtriangular in shape. Along the inner margin a series of seven triangular, backward-directed denticles extends to the posterior end of the jaw. The irregularly directed denticles are large for the size of the jaw and decrease in size only slightly to the posterior. The curved anterior margin becomes straight and forms a narrow, sharp-pointed shank. A crescent-shaped bight is present on the outer margin. A deep, narrow fossa begins in the shank and extends to the acute posterior extremity. The margins of the fossa are rounded and thickened. One side of the jaw is convex while the other side is concave, especially near the denticles. The figured specimen measures 0.52 mm. in length.

The narrowness of the jaw and the small number and size of the denticles are features that set *Leodicites heteropsis* apart from other species of *Leodicites*. Locality: St. Mary's, Ontario.

*Leodicites incertus* sp. nov.

Maxilla II. Plate 3, Fig. 5, 6, 7

In shape the jaw is subtriangular and arched. The figured specimen measures 0.42 mm. in length. Along the curved inner margin a series of 10 medium-to-large, sharp-pointed, triangular denticles extends to the posterior end. The first denticle is small and is followed by two that become slightly larger. The fourth denticle is large, wide and sharp-pointed. The denticles increase slightly in size from the small fifth tooth to the eighth and decrease in size to the posterior. The anterior margin is slightly incurved and forms a narrow, sharp-pointed shank. Midway along the curved outer margin is a small protuberance or shank. A deep, narrow fossa begins at the anterior shank and continues to the posterior end of the jaw. The margins of the fossa are rounded and slightly thickened.

This form is not very similar to any other species. It is, however, typical of the genus and has certain specific details that are found in other forms. *Leodicites biformis* Eller (1945) has the small protuberance similar to *Leodicites incertus*. The irregular size and distribution of the denticles is common in a number of forms of *Leodicites*. Locality: St. Mary's, Ontario.

*Leodicites inflatus* sp. nov.

Maxilla II. Plate 3, Fig. 13

The jaw is narrow and subtriangular in shape. The figured specimen measures 0.48 mm. in length and 0.28 mm. in width. Along the slightly curved inner margin a series of seven denticles extends nearly to the acute

posterior extremity. The first denticle is medium-sized, conical, sharp-pointed, and slightly hooked. The following tooth is of equal size. The third tooth is blunt, slightly inflated and several times larger than any other denticle. The remaining denticles are small and backward-directed, and decrease in size only slightly to the posterior. The anterior margin is incurved from the fang and forms a small, hooked, sharp-pointed shank which is slightly oblique to the surface of the jaw. Adjacent to this shank and along the curved outer margin is another small, subtriangular shank. A narrow, deep fossa occupies the complete length of the jaw. The margins of the fossa are thickened and rounded.

*Leodicites inflatus* is similar to *Leodicites incertus*, Plate 3, Fig. 5, 6, 7 but differs in the character and arrangement of the denticles and the shank. Both forms bear the small, secondary shank on the outer margin. Locality: Delaware, Ohio.

*Leodicites indecorus* sp. nov.

Maxilla II. Plate 3, Fig. 20

The jaw is small and irregularly triangular in shape, and the figured specimen measures 0.37 mm. in length and 0.25 mm. in width. A series of eight blunt, conical denticles extends the full length of the inner margin. The first denticle is large and slightly hooked. The remaining denticles are fairly large for the size of the jaw and are perpendicular to the margin; they decrease in size gradually to the posterior end of the jaw. The anterior margin is rounded, curves abruptly, and forms with the outer margin a large triangular shank. On the surface a large, deep-to-shallow fossa extends nearly the full length of the jaw. In the anterior area of the fossa is a ridge that is not reflected on the opposite side of the jaw. Both the lateral margins of the fossa are wide and flattened toward the posterior end. The area on the surface between the margin of the fossa and the denticles is narrow. The opposite of the jaw is fairly convex and smooth.

*Leodicites indecorus* is not very similar to other forms of the genus. Locality: Goderich, Ontario.

*Leodicites lacunosus* sp. nov.

Maxilla II. Plate 4, Fig. 34

In outline the jaw is subtriangular. It is small in size, and the figured specimen measures 0.32 mm. in length and about 0.31 in width. Along the inner side a series of five or six conical, sharp-pointed denticles extends nearly to the acute posterior extremity. The first denticle is slightly larger and thicker than the other teeth and it appears to be a continuation of the margin of the fossa. The remaining denticles are nearly uniform in size or decrease only slightly to the end of the jaw. The anterior margin is angular and forms a small shank with the outer margin. The fossa is a rather deep depression and occupies about two-thirds of the side of the jaw. Two margins of the fossa are thickened and rounded while the third is thin and broken.

This species does not correspond very closely to other forms of the genus. Locality: Goderich, Ontario.

*Leodicites lamellosus* sp. nov.

Maxilla II. Plate 5, Fig. 18, 19

Since the outer margin is thin and broken, the width of the jaw can only be estimated. In length the jaw measures 0.47 mm. and the width is perhaps 0.35 mm. On the inner margin a series of seven denticles extends nearly to the acute posterior extremity. The first denticle is sharp-pointed and slightly out of alignment with the other teeth. It is followed by a larger, thin tooth that is broken in the figured specimen but was probably pointed. The remaining denticles are triangular and are directed slightly backwards. A small, rounded bight is present on the lower side of the outer margin and it forms a narrow shank with the anterior margin. The side of the jaw adjacent to the narrow shank is concave or flattened; the opposite side is convex. A narrow fossa extends the full length of the jaw. The margin of the under side of the fossa is slightly thickened and rounded. The upper side of the outer margin is extended and thin and broken.

*Leodicites lamellosus* is similar to *Leodicites brooksi* Eller (1945) except for the width of the upper side of the jaw, the size of the first denticle, and the shape of the under side. Locality: Delaware, Ohio.

*Leodicites reimanni* Eller

Maxilla II

*Leodicites reimanni* Eller, 1941, Annals of the Carnegie Museum, v. 28, p. 333, 334, pl. 38, fig. 10, 11, 12, 13.

*Leodicites reimanni* Eller was found only in the Delaware Limestone of Ohio.

## Genus PALEOENONITES Eller, 1942

*Paleoenonites latidorsatus* sp. nov.

Maxilla II. Plate 3, Fig. 8

The jaw is broadly triangular in shape. The figured specimen measures 0.42 mm. in length and 0.37 mm. in width. Along the inner margin a series of seven small, triangular denticles extends nearly to the posterior end of the jaw. The first denticle is long, thin and sharp-pointed and is directed in a forward position. The remaining teeth are triangular in shape, nearly uniform in size, and point only slightly to the posterior. The anterior margin is slightly incurved while the outer margins are broadly curved. A wide, fairly deep, triangular fossa occupies more than one-half the area of the jaw. The margin of the fossa is thickened and rounded while the opposite one is thin and usually broken.

*Paleoenonites latidorsatus* is similar in a general way to other forms of the genus. It differs in the number and arrangement of the denticles and the shape of the fossa. Locality: Goderich, Ontario.

*Paleoenonites informis* sp. nov.

Maxilla II. Plate 3, Fig. 9, 19, 26, 27

In outline the jaw is irregularly triangular and the figured specimens measure from 0.40 mm. to 0.65 mm. in length. Along the inner margin a series of seven to nine large, conical, widely-spaced denticles extends nearly

to the posterior end of the jaw. The first denticle is thin, sharp-pointed and slightly hooked. The second denticle may be larger than the first. The remaining teeth decrease in size rapidly to the posterior. The anterior margin incurves to form a sharp-pointed shank that points in a forward direction and is often oblique to the surface of the jaw. This obliquity develops a deep concave groove on the side of the jaw. A deep irregularly shaped fossa occupies the complete length of the jaw. It is wide anteriorly but very narrow in the posterior half of the jaw. The lateral margin is thickened and rounded but the adjacent margin is thin and usually broken.

Most of the specimens of *Paleoenonites informis* were found in a broken condition. The form differs from other species in the number, size and arrangement of the denticles, the shapelessness of the fossa and the curvature of the shank. Locality: Goderich, Ontario.

*Paleoenonites incurvus* sp. nov.

Maxilla II. Plate 3, Fig. 10

In shape the jaw is wide and subtriangular. The figured specimen measures 0.40 mm. in length and 0.42 mm. in width. On the inner margin a series of seven blunt, triangular denticles extends to the acute posterior end of the jaw. The first denticle or fang is angular and sharp-pointed. It widens rapidly and appears to be part of the anterior margin. The posterior edge of the fang, together with a central ridge, extends to the outer margin. The remaining denticles decrease in size gradually to the posterior. The anterior margin is wide and incurves to form a large and broad shank. Along the anterior area the shank is slightly concave. A large, deep, triangular fossa extends the full length of the jaw. The margin of the side of the fossa is slightly thickened while the opposite one is thin and usually broken.

The general shape of the jaw is similar to many forms of *Paleoenonites*. The character of the first denticle differs considerably from other species. Locality: Cheapside, Ontario.

*Paleoenonites latissimus* sp. nov.

Maxilla II. Plate 3, Fig. 11

Measurement of the very wide, triangular jaw shows the width to be greater than the length. The figured specimen is 0.45 mm. in length and 0.50 mm. in width. Along the inner margin a series of eight blunt, short, triangular denticles extends nearly to the posterior end of the jaw. The first and second denticles are large and are followed by smaller teeth that decrease in size posteriorly. The anterior margin curves gently and then turns abruptly downward to form a large, wide, triangular, nearly straight-sided shank. A large, fairly deep fossa occupies more than one-half the surface of the jaw. The outer margin of the jaw and the anterior margin of the shank are thickened and rounded. The outer margin of the shank is thin and usually broken. Adjacent to the first denticle the jaw is concave while the posterior and the opposite side are convex.

A number of forms of *Paleoenonites* have a large shank and fossa. *Paleoenonites latissimus* differs from others in its general shape and the character of the denticles. Locality: Benmiller, Ontario.



*Paleoenonites hiulcus* sp. nov.

Maxilla II. Plate 3, Fig. 12

In outline the jaw is irregularly rectangular and the width is nearly equal to the length. The figured specimen measures 0.52 mm. in length and 0.47 mm. in width. Along the curved inner margin a series of about twelve sharp-pointed, triangular denticles extends nearly to the acute posterior end of the jaw. The first denticle or fang is large and is followed by two more teeth only slightly smaller. The remaining denticles are small and decrease in size posteriorly where they become minute. A large, deep fossa occupies the full length of the jaw. The posterior end of the flange does not connect directly with the end of the jaw, thus leaving a cleft or gap at that end. The margins of the fossa are only slightly thickened and rounded. The area on the surface between the margin of the fossa and the denticles is narrow and slightly concave.

*Paleoenonites hiulcus* is similar in shape to *Paleoenonites auctificus* Eller (1955). They differ in the number and character of the denticles and the shape of the flange. Locality: St. Mary's, Ontario.

*Paleoenonites lacinatus* sp. nov.

Maxilla II. Plate 3, Fig. 14, 15

In outline the jaw is irregularly triangular, wide anteriorly, and has the lateral margins tapering to an acutely pointed posterior extremity. Along the inner margin a series of nine or ten blunt-to-medium pointed, triangular denticles extends nearly to the posterior end of the jaw. The first denticle or fang is pointed, and slightly hooked, and its lower edge extends nearly to the outer margin of the jaw. The denticles decrease gradually in size to the posterior. The anterior margin incurves from the first denticle and forms a large, broad shank. A large, deep fossa occupies the full length of the jaw. The anterior and adjacent margins of the fossa are thickened and rounded. The lateral margin is thin and seems to be complete in the figured specimen. Both sides of the jaw have concave areas. The figured specimen measures 0.50 mm. in length and about 0.45 mm. in width.

*Paleoenonites lacinatus* is very similar to *Paleoenonites alpenaensis* (Eller) (1955) and *Paleoenonites informis*, plate 3, fig. 9, 19, 26, 27. They differ in the number and arrangement of the denticles and the shape of the shank. Locality: St. Mary's, Ontario.

*Paleoenonites lacertosus* sp. nov.

Maxilla II. Plate 3, Fig. 16, 17

The jaw is angular and subrectangular in shape. The figured specimen measures 0.60 mm. in length. Along the inner margin a series of five strong, large, angular denticles extends about two-thirds the length of the jaw. The first denticle is triangular, medium-pointed, and directed slightly forward, leaving a space between the first two teeth. The remaining denticles are sub-rectangular in shape and are closely arranged without space between them. The outer edge of the denticles is nearly straight. They decrease in size gradually to the posterior. The anterior margin is nearly straight. When the jaw is viewed from the one side a broadly raised ridge is seen to extend to about the mid-area of the outer margin and forms a very small, round

flange. On the opposite side of the jaw the outer margin begins some distance from the anterior and forms a straight-sided obtuse angle. This margin and the inner margin end in an acute posterior extremity. A shallow fossa that extends about two-thirds the length of the jaw is open at the anterior end. The margin of the fossa is slightly thickened.

*Paleoenonites lacertosus* is not very closely related to other forms of this genus. It is unusual to find the fossa open at the anterior end. The angularity of the jaw and the denticles is not found in many species. The figured specimen does not seem to be broken except slightly at the posterior part of the under side of the jaw. Locality: Goderich, Ontario.

*Paleoenonites flaccidus* sp. nov.

Maxilla II. Plate 3, Fig. 18

In outline the jaw is irregularly rectangular. The figured specimen measures 0.50 mm. in length and 0.45 mm. in width. Along the curved inner margin a series of about 14 small, sharp-pointed to blunt denticles extends nearly to the posterior end of the jaw. The first two denticles are sharp, narrow and elongate. They are followed by a series of feeble, closely arranged teeth that are nearly uniform in size. The anterior margin is slightly incurved or straight and forms a large, broad shank with the outer margin. The posterior margin of the shank is nearly straight, and perpendicular to the lateral margins. A large, rectangular fossa occupies about two-thirds the side of the jaw. The anterior and inner margins of the fossa are thickened and rounded while the outer margin is thin and usually broken. The area between the margin of the fossa and the denticles is very narrow.

*Paleoenonites flaccidus*, in a general way, is similar to a number of species of *Paleoenonites*. It differs from other forms in the character and arrangement of the denticles and the shape of the fossa and shank. Locality: St. Mary's, Ontario.

*Paleoenonites hexadactylus* sp. nov.

Maxilla II. Plate 3, Fig. 21

The jaw is subtriangular in shape and tapers to an acute posterior extremity. The figured specimen measures 0.65 mm. in length. Along the inner margins a series of six sharp-pointed to blunt denticles extends about two-thirds the length of the jaw. The first denticle is thin, sharp-pointed, and directed slightly forward. The remaining denticles are blunt, widely-spaced, and directed slightly backward. They decrease gradually in size to the posterior. The anterior margin is nearly straight. An irregularly shaped shank is present on the outer margin. A large, deep fossa extends the complete length of the jaw. The margins of the fossa are only slightly thickened and rounded. The upper side of the jaw is gently concave while the under side is convex.

*Paleoenonites hexadactylus* is similar to *Paleoenonites lacertosus*, plate 3, fig. 16, 17, in general shape but differs in the character of the fossa. Locality: Goderich, Ontario.

*Paleoenonites latimarginatus* sp. nov.

Maxilla II. Plate 3, Fig. 22, 23

In its shape the jaw is irregularly rectangular, and the width is nearly equal to the length. Measurements of the figured specimen are: length 0.45 mm., width 0.37 mm. Along the curved inner margin a series of nine or ten blunt, conical, backward-directed denticles extends the full length of the jaw. The first is fairly large and slightly out of alignment with the others. The remaining denticles decrease in size gradually to a narrow, rounded posterior extremity. From the first denticle the very wide, slightly incurved anterior margin forms a large, broad shank with the rounded outer margin. On one side a deep to shallow fossa occupies most of the jaw. The anterior margin of the fossa is thickened and bears a flattened area adjacent to the fossa and in the incurved area of the margin. The region next to the denticles on the inner side is slightly concave while the outside area is gently convex.

Jaws of this sort seem to be rather scarce. In 1945 Eller described a form *Oenonites* ? *dubius* that is similar to *Paleoenonites latimarginatus*. It was observed at that time that it resembled species from the genus *Leodicites* but that the under side bearing the denticles was unlike that of any species of that genus. Also it was noted that forms of this sort did not fit very well in the genus *Oenonites*. For the present, species of this kind will be placed in the genus *Paleoenonites* in which there seems to be more characteristics than in *Oenonites* and *Leodicites*. Locality: Cheapside, Ontario.

*Paleoenonites geometricus* sp. nov.

Maxilla II. Plate 3, Fig. 24, 25

The jaw is large, angular, and nearly the shape of a parallelogram. The figured specimen measures 0.68 mm. in length and 0.45 mm. in width. A series of nine wide, blunt denticles are arranged in a curve and extends the full length of the jaw. The first and second denticles are about the same size, while the remaining ones are smaller and decrease in size only slightly to the narrow posterior extremity. The anterior margin is nearly straight and forms, at about a right angle with the outer margin, a wide angular shank. The inner lateral margin is also angular, and the area between the edge and the denticles is slightly concave or flattened. A large, deep fossa occupies most of the surface of the jaw. The margins of the fossa are slightly thickened and rounded.

*Paleoenonites geometricus* resembles in a general way *Paleoenonites latimarginatus*, plate 3, fig. 22, 23. *Oenonites* ? *dubius* Eller (1945) seems to be very similar in shape to *Paleoenonites geometricus*. They differ in the curvature and nature of the anterior area and margin and the shape of the fossa and its margins. Locality: Cheapside, Ontario.

*Paleoenonites inops* sp. nov.

Maxilla II. Plate 3, Fig. 26

Most specimens of this form are broken and without strength, especially along the outer margin. The jaw, however, is subtriangular in shape and the figured specimen measures 0.51 mm. in length. A series of six or seven sharp-pointed, triangular denticles extends nearly the full length of the jaw. The first and second denticles are large and are followed by smaller teeth

that decrease in size gradually to the posterior. The anterior margin is nearly straight and is in an oblique position to the lateral margins. Although the shank is broken it is broadly curved from a small bight adjacent to the anterior margin. A deep, narrow fossa extends nearly the full length of the jaw. The concave area on the surface between the slightly thickened margin of the fossa and the denticles is narrow.

Except for the angle of the anterior margin *Paleoenonites inops* is similar to a number of forms of this genus. Locality: Goderich, Ontario.

*Paleoenonites* sp.

Maxilla II. Plate 3, Fig. 29, 30, 34

Due to the incompleteness of the shank and outer margin a specific identification will not be attempted. The denticles and the margin of the fossa on the upper surface are similar to other forms of *Paleoenonites*. Locality: Goderich, Ontario.

*Paleoenonites insperatus* sp. nov.

Maxilla II. Plate 3, Fig. 31, 32

In outline the jaw is subtriangular and tapers to an acute posterior extremity. The figured specimen measures 0.61 mm. in length and 0.30 mm. in width. Along the inner margin a series of nine, conical, sharp-pointed, backward-directed denticles extends nearly to the posterior end. The first two denticles are large, thin, and seem to be adhered. From the fourth denticle, which is slightly larger than the third, the teeth decrease in size gradually to the posterior. The anterior margin is irregularly curved and forms an oblique angle with the inner and outer margins. It terminates in an unexpected acute extremity. A long, deep, narrow-to-wide fossa extends the full length of the jaw. The area on the under surface, between the thickened margins of the fossa, is wide and concave.

*Paleoenonites insperatus* is not very closely related to other forms of the genus. *Paleoenonites informis*, plate 3, fig. 9, 12, 26, 27, has an anterior margin that is somewhat oblique to the lateral margins and an acute extremity that is similar to *Paleoenonites insperatus*. Locality: Goderich, Ontario.

*Paleoenonites lituus* sp. nov.

Maxilla II. Plate 3, Fig. 33

The jaw is elongate and the figured specimen measures 0.65 mm. in length and 0.18 mm. in width. Along the inner margin a series of about 15 conical, sharp-pointed to blunt denticles extends nearly the full length of the jaw. The first denticle or fang is long, crooked, thin and pointed. The next seven teeth are small, pointed and perpendicular to the inner margin. The remaining denticles are large, blunt, fairly uniform in size, and point in a backward-direction. A large oval fossa occupies most of one side of the jaw. The margins of the fossa are thickened and rounded. Only a suggestion of a shank occurs on the outer margin.

In general shape *Paleoenonites lituus* is similar to other forms. The denticles are quite different from those of other species. Locality: Cheapside, Ontario.



*Paleoenonites indentus* sp. nov.

Maxilla II. Plate 3, Fig. 35, 36

The jaw is narrowly triangular and tapers from the anterior only slightly to the truncate posterior extremity. The figured specimen measures 0.49 mm. in length and 0.17 mm. in width. On the inner margin a series of nine conical, sharp-pointed, backward-directed denticles extends nearly to the posterior end of the jaw. The first denticle or fang is a little larger than the other teeth and it is slightly hooked. The remaining denticles increase in size slightly to the mid-area and then decrease in size posteriorly. The anterior margin is slightly incurved and then turns abruptly to form a small indented bight and an angular shank with the straight outer margin. A narrow, deep fossa occupies about three-fourths the length of the jaw. The margins of the fossa are thickened and rounded. One side of the jaw is convex while the narrow area between the fossa and the denticles on the opposite side is concave.

Except for the denticles and the shape of the shank, *Paleoenonites indentus* resembles, in a general way, *Paleoenonites castigatus* Eller (1945), *Paleoenonites lituus* plate 3, fig. 33, and *Paleoenonites formosus*, plate 3, fig. 38, 39. Locality: Goderich, Ontario.

*Paleoenonites limulurus* sp. nov.

Maxilla II. Plate 3, Fig. 37

The jaw is large, triangular in shape, wide anteriorly, and tapers to a pointed posterior extremity. The figured specimen measures 0.65 mm. in length and 0.30 mm. in width at the widest part. Along the inner margin a series of nine triangular, sharp-pointed denticles extends the full length of the jaw. The first three denticles are large and are followed by smaller teeth that decrease in size to the posterior. The denticles are mostly perpendicular to the margin of the jaw. The anterior margin is rounded and forms with the outer margin an angular shank. At the anterior end of the outer margin of the jaw is a small shank-like projection. A narrow, deep fossa extends most of the length of the jaw. The margins of the fossa are slightly thickened and rounded. One side of the jaw is irregularly concave and convex, while the opposite side is concave.

*Paleoenonites limulurus* resembles only in a general way other forms of the genus. Locality: St. Mary's, Ontario.

*Paleoenonites formosus* sp. nov.

Maxilla II. Plate 3, Fig. 38, 39

In shape the jaw is narrowly triangular, and when observed from one angle it tapers to an acute posterior extremity. The figured specimen measures 0.66 mm. in length and 0.28 mm. in width at the anterior third of the jaw. Along the inner margin a series of 11 triangular, sharp-pointed denticles extends nearly the full length of the jaw. The first denticle is fairly large, sharp-pointed and perpendicular to the lateral margins of the jaw. The posterior edge of the fang begins about opposite the third denticle. The second and third denticles are small, perpendicular to the jaw and slightly adhered. The remaining denticles are large and backward-directed. They

increase in size slightly to about the mid-area and then decrease very gradually in size to the posterior. From the fang the anterior margin curves gently and then incurves to form with the thin outer margin a nearly straight-sided shank. The fossa is narrow and shallow and extends about three-quarters of the length of the jaw. The area on the surface between the thickened and rounded margin is very narrow and concave. The opposite side of the jaw is generally convex except at the anterior end where it is flattened.

In shape *Paleoenonites formosus* is similar to a number of forms of this genus. They differ in the width of the jaw, the character and arrangement of the denticles, and the shape and size of the fossa and shank. Locality: Goderich, Ontario.

*Paleoenonites flexuosus* sp. nov.

Maxilla II. Plate 3, Fig. 40, 41, 42

The jaw is irregular in outline and shape. The figured specimen measures 0.55 mm. in length and 0.25 mm. in width. Along the curved inner margin a series of nine large, triangular, backward-directed denticles extends nearly the full length of the jaw. The denticles are oblique to the under surface of the jaw. The margins of the fossa are slightly thickened and rounded. The area between the margin of the fossa and the denticles may be flattened or slightly concave. The opposite surface of the jaw is irregularly convex.

*Paleoenonites flexuosus* is similar in outline to a number of forms of *Paleoenonites*. The irregular shape of the fossa is also observed in several species. The various forms differ in the number, shape, and arrangement of the denticles and in the shape of the shank. Locality: Delaware, Ohio.

*Paleoenonites alpenaensis* (Eller)

Maxilla II

*Oenonites alpenaensis* Eller, 1938. Annals of the Carnegie Museum, v. 27, p. 280, pl. 29, fig. 1, 2.

*Paleoenonites alpenaensis* (Eller), 1955. Annals of the Carnegie Museum, v. 33, p. 355, pl. 23, fig. 24.

This form was found to be plentiful at most localities of the Delaware Limestone that were studied.

Genus EUNICITES Ehlers, 1868

*Eunicites lanceolatus* sp. nov.

Maxilla IV or V. Plate 4, Fig. 1

The jaw is a single, angular, slightly arched, very sharp-pointed denticle. A large fossa occupies most of one surface and extends about three-quarters of the way along the posterior edge of the jaw. The margins of the fossa are thickened. In cross-section, the surfaces of the jaw are nearly at right angles and they are irregularly flattened or slightly concave. The figured specimen measures 0.77 mm. in length and about 0.22 mm. in width at the widest part.

*Eunicites lanceolatus* is similar in shape to other forms of the genus. In a

number of species the fossa is extended into the anterior end of the denticle. This is demonstrated in *Eunicites cavus* Eller (1945), *Eunicites apidodus* Eller (1955), and especially *Eunicites apiculatus* Eller (1955). Locality: Delaware, Ohio.

*Eunicites admirandus* Eller

Maxilla IV or V. Plate 4, Fig. 2

*Eunicites admirandus* Eller, 1955. Annals of the Carnegie Museum, v. 33, p. 358, pl. 24, fig. 9.

The figured specimen measures 0.55 mm. in length. In most respects the Delaware Limestone specimens resemble the Potter Farm Formation (Devonian) forms very closely. In some specimens the difference is noticeable in the sharpness of the denticle or the angularity or roundness of the tooth. Locality: Goderich, Ontario.

*Eunicites* sp.

Maxilla IV or V. Plate 4, Fig. 3

Since considerable part of the jaw is missing, specific identification will not be attempted. It is similar to *Eunicites admirandus* Eller (1955) in a general way. One difference is that the curve of the denticle is in a different plane. Locality: Goderich, Ontario.

*Eunicites florealis* sp. nov.

Maxilla IV or V. Plate 4, Fig. 4

In outline the denticle or jaw is subtriangular, consisting of a wide, heavy base that tapers to a blunt, slightly hooked end. The figured specimen measures 0.58 mm. in length and 0.42 mm. in width. The anterior margin is slightly curved or nearly straight, while the posterior margin incurves abruptly to form a small hooked shank. A large fossa occupies nearly half of the surface of the jaw. The margins of the fossa are wide and rounded. One surface of the tooth is flattened or may be slightly concave.

*Eunicites florealis* is similar to *Eunicites altidorsalis* Eller (1955) except for the heaviness of the denticle and the shape of the fossa and shank. Locality: Goderich, Ontario.

*Eunicites hemicyclus* sp. nov.

Maxilla IV or V. Plate 4, Fig. 5

Semicircular in outline the jaw consists of a single denticle with a heavy, elongated shank or base. The denticle is conical, heavy, sharp-pointed and backward-directed. A long, deep fossa, wide anteriorly and narrow at the posterior, occupies more than half the area of the jaw. The margins of the fossa are thickened and rounded. The figured specimen measures 0.35 mm. in length.

This form is similar to *Arabellites uncinatus* Hinde (1882), *Eunicites colossus* Eller (1955), and *Eunicites clarus* Eller (1961). The forms differ

mostly in the size and shape of the fossa and the length and shape of the shank. Locality: St. Mary's, Ontario.

*Eunicites ambocoelius* Eller

Maxilla IV or V. Plate 4, Fig. 6

*Eunicites ambocoelius* Eller, 1955. Annals of the Carnegie Museum, v. 33, p. 360, pl. 24, fig. 23.

In length the figured specimen is 0.45 mm. and in width 0.37 mm. The denticle is more pointed and the fossa deeper than the form described from the Potter Farm Formation of Michigan. Locality: Bloomfield, Ohio.

*Eunicites apicalis* ? Eller

Maxilla IV or V. Plate 4, Fig. 7, 8

*Eunicites apicalis* Eller, 1955. Annals of the Carnegie Museum, v. 33, p. 356, pl. 24, fig. 1.

The figured specimen and other broken specimens suggest that the form may be *Eunicites apicalis* Eller (1955). Measurements suggest that the specimen may be around 1.0 mm. in width and in length nearly as much. *Eunicites denticuleatus* Eller (1942) and *Eunicites whiteae* Eller (1945) resemble *Eunicites apicalis* ? in proportions but differ in size, the shape of the fossa, and the curvature of the posterior margin. Locality: Goderich, Ontario.

*Eunicites asaphus* ? Eller

Maxilla IV or V. Plate 4, Fig. 9, 10

*Eunicites asaphus* Eller, 1955. Annals of the Carnegie Museum, v. 33, p. 357, pl. 24, fig. 22.

Only imperfect specimens of this form were found. This was also true of the Potter Farm Formation specimens. The denticle of the Delaware Limestone form is much shorter and the jaw is wider in proportion than the originally described species. Locality: Goderich, Ontario.

*Eunicites limbatus* sp. nov.

Maxilla IV or V. Plate 4, Fig. 11, 12

The jaw consists of a short, single denticle with a wide, rounded, bordered base or shank. The posterior end is truncate. The figured specimen measures 0.42 mm. in width and 0.32 mm. in length. The fang is irregularly flattened and acute, but widens rapidly to the base. A small oval, shallow fossa is present on one side of the jaw. The margins of the fossa are wide, especially at the outer side. Adjacent and posterior to the fossa is a flat angular shank.

*Eunicites limbatus* is similar to *Eunicites ansatus* Eller (1945) except for the width of the shank and the shortness of the denticle. Locality: St. Mary's, Ontario.

*Eunicites fimbriatus* sp. nov.

Maxilla IV or V. Plate 4, Fig. 14, 15

The jaw consists of a single large, thick, angular denticle which tapers abruptly from a wide base to a very sharp, needle-like tooth. When observed from the side this small tooth seems to begin as a ridge on the surface of the jaw. The figured specimen measures 0.45 mm. in length and 0.57 mm. in



width. Along the very sharp edges of the denticle is a series of minute spines, hair-like crenulations or teeth. They begin adjacent to the needle-like tooth and extend the full length of the denticle. The minute fringe-like teeth on the anterior side of the denticle are much more closely arranged than those on the posterior side. A large oval fossa occupies about one-half of the upper side of the jaw. The margin or shank between the fossa and the denticles is wide and rounded. It appears to overlap the flattened or slightly concave inner area of the jaw. The under side of the jaw is convex except for the shank, which is flattened.

Denticles with minute spines or teeth have been found in a number of unrelated forms and from various geologic ages. Often very similar forms have been described but without these extra hair-like teeth. As an example, *Eunicites ambocoelius* is very like the above described species except for the wide margin or shank. There is no evidence, however, of minute teeth having been attached to the denticle. Other forms, *Eunicites geisacanthus* Eller (1945), *Eunicites acis* Eller (1945), *Eunicites barbaricus* Eller (1945), and *Nereidavus invisibilis* Eller (1940) unlike *Eunicites fimbriatus* have been described bearing minute teeth. In outline and shape very similar forms without extra teeth, and in the case of *Nereidavus invisibilis* with normal teeth, have been compared to these species. Perhaps at some particular time in the life of the animal these extra crenulations or saw-tooth projections developed on the sides of the denticles or jaw. Locality: Cheapside, Ontario.

### Genus ANISOCERASITES Eller, 1955

#### *Anisocerasites* sp. indet.

#### Maxilla III. Plate 4, Fig. 13

The jaw is large and irregular in shape. In its broken condition it measures 0.51 mm. in length and 0.45 mm. in width. A series of five, possibly six conical, sharp-pointed denticles are present along the inner margin. The first denticle is medium in size and is set back from the other teeth. The second denticle is the largest and is followed by smaller teeth that decrease in size posteriorly.

Since this form is represented by only one specimen which is also broken, specific identification will not be attempted. The form cannot be compared closely with any other species but it has the characteristics of the genus. Locality: Goderich, Ontario.

#### *Anisocerasites insignis* sp. nov.

#### Maxilla III. Plate 4, Fig. 16

The jaw is large and remarkably heavy in appearance. The figured specimen measures 0.92 mm. in length and 0.85 mm. in width. Along the inner margin a series of five large, blunt, conical denticles extends the full length of the jaw. The denticles increase in size from the first tooth to the very large third denticle, and then decrease in size to the fifth, which is very small. The denticles are perpendicular to the slightly arched margin. A narrow, deep fossa extends the full length of the jaw. The fossa is notched at the anterior end. The margins of the fossa are very thick and rounded. The

anterior margin is gently curved and forms an irregularly shaped shank with the nearly straight outer margin. The posterior end of the jaw is rounded. One surface is highly convex while the opposite side is slightly concave or flattened.

Although *Anisocerasites insignis* falls within the qualifications of the genus, it does not correspond very closely to any other species. Locality: Goderich, Ontario.

*Anisocerasites longidactylus* sp. nov.

Maxilla III. Plate 4, Fig. 19

The jaw is elongate and the figured specimen, which is broken, measures 0.77 mm. in length. A series of seven sharp-pointed denticles occupies the inner margin. The first three denticles are minute and are directed slightly forward. The fourth or middle denticle is very long-fingered, angular, and slightly hooked. It is followed by three remaining teeth that are small and conical in shape. A fossa occupies part of one side of the jaw. Since the outer margin is broken the exact shape of the fossa cannot be described. Both surfaces of the jaw are irregular.

*Anisocerasites longidactylus* resembles, in a general way, *Anisocerasites acanthophorus* Eller (1955) and *Anisocerasites tridentus* (Stauffer) (1933). They differ in the number of denticles and the shape of the fossa. All three forms have the large middle denticle with the small teeth on either side. Locality: Delaware, Ohio.

*Anisocerasites* sp. indet.

Maxilla III. Plate 4, Fig. 17, 18

This form, although broken, seems worth figuring. The jaw is large and has a very large medium tooth with probably two to three smaller denticles on each side. The denticles are conical, sharp-pointed and perpendicular to the lateral margins. Locality: Delaware, Ohio.

*Anisocerasites gigas* sp. nov.

Maxilla III. Plate 4, Fig. 20, 21

The jaw is large, rounded and irregular in outline. The figured specimen measures 0.72 mm. in length and 0.95 mm. in width. A series of four blunt, conical denticles extends the full length of the jaw. The first tooth is minute and it is followed by a very large, heavy median denticle. The third and fourth denticles are small and decrease in size to the posterior. All the denticles are perpendicular to the lateral margin or may point slightly backwards. The anterior margin is deeply incurved and forms with the outer margin a large rounded shank. A large, deep fossa occupies most of the one side of the jaw including the shank. The margins of the fossa are wide, thickened, and rounded. The side of the jaw is convex except for the area adjacent to the denticles on the innerside.

*Anisocerasites tanaodus* (Eller) (1938) (1955) resembles *Anisocerasites gigas* very closely. They differ in the shape of the denticles and fossa. *Anisocerasites amplimarginatus* Eller (1955) is similar to *Anisocerasites gigas* only in a general way. Locality: Bloomfield, Ohio.

*Anisocerasites globosus* sp. nov.

Maxilla III. Plate 4, Fig. 22, 27, 28

In outline the jaw is nearly circular or globular. The figured specimens measure 0.42 mm. and 0.47 mm. in length. The width is probably slightly greater since the outer margin is thin and broken in all specimens. Along the curved inner margin a series of eight blunt, conical denticles extends the full length of the jaw. The first two denticles are minute and appear to overlap each other. The third tooth is very large and is followed by an even larger median denticle. The remaining denticles are smaller, closely compact and decrease in size to the posterior. A deep, angular fossa extends the full length of the jaw. The area between the thickened margin of the fossa and the denticles is concave. The opposite side of the jaw is convex.

*Anisocerasites globosus* does not compare very closely with other forms of the genus. Locality: St. Mary's, Ontario; Goderich, Ontario.

*Anisocerasites feroculus* sp. nov.

Maxilla III. Plate 4, Fig. 23, 24

The jaw is subtriangular in outline. The figured specimen measures 0.67 mm. in length and about 0.37 mm. in width. Along the inner margin a series of 11 conical, sharp-pointed, backward-directed denticles extends to the acute posterior extremity. The first two denticles are small and the third is large. The remaining teeth decrease in size gradually to the posterior. The denticles are oblique to the surface of the jaw. The anterior margin incurves and forms a shank with the straight outer margin. A deep, triangular muscle fossa extends the complete length of the jaw. The margins of the fossa are thickened and rounded. The areas adjacent to the denticles are slightly concave.

*Anisocerasites feroculus* is similar to *Anisocerasites validus* (Eller) (1955). They differ in the shape of the fossa and outer margins. Locality: Goderich, Ontario.

*Anisocerasites* sp. indet.

Maxilla III. Plate 4, Fig. 25, 26

A number of forms are present in the fauna similar to the figured specimen. In each case the jaws are broken and poorly preserved. Most of the specimens measure about 0.30 mm. in length and 0.40 mm. in width. There are two prominent denticles with smaller teeth on each side. The fossa is narrow and the margins are broken on all specimens. The surface of the jaw is irregular. Locality: Cheapside, Ontario.

*Anisocerasites* sp. indet.

Maxilla IV. Plate 4, Fig. 35, 36

Many specimens of this general form are present at most localities. In each case the specimens are broken or are not complete enough for specific descriptions. Most of the jaws have a small initial denticle followed by a more prominent tooth. The third and fourth denticles are small or minute. The posterior portion of the jaw is incomplete in all specimens examined. Locality: Goderich, Ontario.

Genus *UNGULITES* Stauffer, 1933*Ungulites indigestus* sp. nov.

Maxilla III. Plate 4, Fig. 29

The jaw is subtriangular with nearly straight margins. The figured specimen measures 0.65 mm. in length and 0.30 mm. in width. The first denticle is large, conical, and sharp-pointed and is a continuation of the lateral margins. Two small, conical, sharp-pointed, slightly hooked denticles are present on the inner margin. These are followed by two minute teeth. These denticles are arranged without too much order. An irregularly shaped fossa occupies about half the jaw. The margins of the fossa are wide, thickened and rounded. The surfaces of the jaw are irregularly convex and concave.

*Ungulites indigestus* cannot be compared very closely with other forms. Locality: Delaware, Ohio.

*Ungulites fusus* sp. nov.

Maxilla III. Plate 4, Fig. 30

A series of seven small, sharp-pointed, conical, forward-directed denticles is present on a subtriangular jaw. The figured specimen measures 0.38 mm. in length and 0.27 mm. in width. The first denticle or fang is thin, sharp-pointed and slightly hooked. The remaining denticles are small and nearly uniform in size and are oblique to the surface of the jaw. The posterior end of the jaw is widely spread and broadly notched. A large fossa occupies about half the area of the jaw. The surface is irregularly convex and concave.

*Ungulites fusus* does not seem to be very closely related to any other described form. Locality: Goderich, Ontario.

*Ungulites* sp. indet.

Maxilla III. Plate 4, Fig. 31

Due to the broken condition of the specimen and the fact that there is only one in the fauna, specific identifications will not be attempted. The jaw is large, subtriangular in shape with most of the posterior end missing. The broken specimen measures 0.67 mm. in length and 0.42 mm. in width. A large, elongated, slightly-hooked, probably sharp-pointed fang is present. Along the inner margin, which forms nearly a right angle, a series of seven small, tubular, sharp-pointed denticles of irregular length extends nearly to the end of the jaw. The first two denticles are directed nearly at right angles to the remaining five. The arrangement of the denticles in this manner has not been noted on other forms. The surfaces of the jaw are convex but irregular.

Except for the arrangement of the denticles *Ungulites* sp. indet. is similar to *Ungulites* ? *chilalloeus* Eller (1961). Locality: Goderich, Ontario.

*Ungulites glyptus* sp. nov.

Maxilla III. Plate 4, Fig. 32, 37

In outline the jaw is subtriangular. The figured specimens measure 0.63 mm. and 0.58 mm. in length and about 0.27 mm. and 0.25 mm. in width. Along the inner margin a series of four small conical, sharp-pointed denticles extends nearly to the posterior end of the jaw. The first denticle or fang is thin, sharp-pointed and slightly hooked. The remaining teeth are nearly



uniform in size. A narrow fossa is present on one side of the jaw. The margins of the fossa are thin and usually broken. The surfaces of the jaw are irregularly sculptured or convex and concave.

There is a similarity between *Ungulites glyptus* and *Ungulites ? chilalloeus* Eller (1961). Locality: Goderich, Ontario.

*Ungulites* sp. indet.

Maxilla III. Plate 4, Fig. 33

So much of the jaw is missing that specific identification will not be attempted. Close examination suggests that only three large denticles were present on the inner margin. The first denticle is very large, conical and sharp-pointed. Considerable space separates the second medium-sized tooth. The third denticle is minute and points slightly backward. Not enough of the remaining posterior end of the jaw is present to warrant description. Locality: Goderich, Ontario.

*Ungulites lupatus* sp. nov.

Maxilla III. Plate 4, Fig. 38

The jaw is small and angular. The figured specimen measures 0.38 mm. in length and 0.25 mm. in width. Along the inner margin a series of seven denticles extends the full length of the jaw. The first denticle is thin, very long and sharp-pointed. The second tooth is small, blunt and conical. It is followed by two slightly larger denticles. The remaining teeth are small, sharp-pointed, and fairly uniform in size. A narrow, deep fossa extends from the anterior to the posterior end of the jaw. The margins of the fossa are slightly thickened and rounded.

Except for the denticles and the shortness of the first tooth, *Ungulites lupatus* is similar to *Ungulites sumnerae* Eller (1945) and *Ungulites longidentatus* Eller (1945). Locality: Delaware, Ohio.

*Ungulites* sp. indet.

Maxilla III. Plate 4, Fig. 39

This form, although broken, seems worth mentioning since it cannot be compared very closely to other species. The jaw is large and measures in its broken condition 0.52 mm. in length and 0.31 mm. in width. On the inner margin are four angular to conical denticles. The first tooth is very large and wide at the base. The remaining denticles are small and narrow and may be sharp-pointed. The surfaces of the jaw are irregularly concave and convex. Locality: Goderich, Ontario.

Genus STAUROCEPHALITES Hinde, 1879

*Staurocephalites alterostris* Eller

*Staurocephalites alterostris* Eller, 1955. Annals of the Carnegie Museum, v. 33, p. 353, pl. 23, 8-15.

In size the jaws measure from 0.65 mm. to 1.02 mm. in length and 0.17 mm. to 0.37 mm. in width. A series of 12 to 14 triangular, sharp-pointed denticles extends along the inner margin nearly to the rounded posterior end. Most

of the denticles point slightly in a backward-direction. The first denticle is large and appears to be an extension of the thickened margins. The second denticle is small or minute. It is followed by 10 to 12 teeth that decrease in size uniformly to the posterior. The anterior margin of the jaw is straight and long and forms an acute angle with the lateral margins. Both sides of the jaw are slightly convex except near the denticles. A large, fairly narrow fossa extends the full length of the jaw where complete. The margins of the fossa are slightly thickened and rounded.

Kielan-Jaworowska (1961) has erected two new genera, *Vistulella* and *Mochtyella* for forms that belong to the genus *Staurocephalites*. Hinde erected this genus in 1879. An examination at the British Museum (Natural History) of the genotype *Staurocephalites niagarensis* Hinde (1879) and a species *Staurocephalites serrula* Hinde (1880) shows close relationship to the maxilla I of Kielan-Jaworowska's species. The fact that additional parts of of the jaw apparatus have been found in articulation does not invalidate a genus that was erected more than 80 years ago. Paleontology has many records in which parts of fossil plants and animals have been described separately under various genera before a complete form has been found. If the International Rules of Zoological Nomenclature are to be followed the first described genus rates priority. *Staurocephalites* species are common in Paleozoic rocks. Stauffer (1933) described four typical *Staurocephalites* forms and two species, *Lumbriconereites perfectus* and *Lumbriconereites modestus*, that should be included under the genus *Staurocephalites*. Another form, *Arabellites* sp. a, Stauffer (1933) was described as a fragment. Actually this specimen is fairly complete and should be included under the genus *Staurocephalites*. *Staurocephalites articulatus* Eller (1955), and *Staurocephalites aequilateralis* Eller (1955) have characteristics similar to *Staurocephalites alterostris*. Eller (1961) described four forms of *Staurocephalites* that are related in a general way to *Staurocephalites alterostris*. Heretofore the writer has considered jaws of this type to be maxilla II. Kielan-Jaworowska (1961) has demonstrated from articulated specimens that they are maxilla I. Locality: Cheapside, Ontario; St. Mary's, Ontario.

*Staurocephalites latibrachiatus* sp. nov.

Maxilla I. Plate 5, Fig. 3, 4

At the anterior the jaw is wide, narrowing gradually to the blunt posterior end. The well armed figured specimen measures 0.87 mm. in length and 0.35 mm. at the widest part. A series of 11 large, triangular, sharp-pointed denticles extends in a curve the full length of the jaw. The first denticle, while not as long as some of the adjacent ones, is wider at the base and conical in shape. It is pointed forward while the rest of the denticles are directed toward the posterior. The first three or four teeth are large, especially for the size of the jaw. They then decrease rapidly in size to the posterior end. The anterior margin is irregular and terminates in a small angular shank. The lateral margins are curved. A large fossa, wide anteriorly and narrow posteriorly, occupies the full length of the jaw. The margins of the fossa are thickened and rounded.

*Staurocephalites latibrachiatus* is similar in a general way to a number of forms in the genus. Locality: Delaware, Ohio.

*Staurocephalites liratus* sp. nov.

Maxilla I. Plate 5, Fig. 5, 6

The size of the jaw is large and wide. The figured specimen measures 1.12 mm. in length and about 0.32 mm. in width. Along the curved inner margin a series of 14 triangular, sharp-pointed, backward-directed denticles extends nearly the full length of the jaw. The denticles are fairly uniform and decrease gradually in size to the rounded posterior end. An outer margin incurves at about the anterior third of the jaw. The area along the posterior two-thirds of this margin and adjacent to the denticles is slightly furrowed, and concave, and may have been the location of a secondary jaw. A large, deep fossa extends the full length of the jaw. It is wide anteriorly and narrow posteriorly. The margins of the fossa are slightly thickened and rounded.

There is a slight resemblance between *Staurocephalites liratus* and *Staurocephalites paquettensis* Eller (1945). They differ at the anterior end of the jaw and in the arrangement of the denticles. Locality: St. Mary's, Ontario.

*Staurocephalites icosidactylus* sp. nov.

Maxilla I. Plate 5, Fig. 7

The jaw is long and narrow and the figured specimen measures 0.63 mm. in length and about 0.2 mm. in width. Along the inner margin a series of 20 to 22 backward-directed denticles extends the full length of the jaw. The first denticle is triangular in shape and very sharp-pointed. It is followed by two teeth that are small. The fourth denticle is larger and sharp-pointed and it is followed by three large, wide, blunt denticles. From this point they decrease in size gradually to denticles that are so minute that they can hardly be detected. The anterior of the jaw tapers to an acute end, while the posterior extremity is blunt or rounded. A large, deep fossa extends the full length of the jaw. The margins of the fossa are thickened and rounded. The area between the margin of the fossa and the denticles is concave, while the opposite side is convex.

There are a number of forms of *Staurocephalites* that resemble *Staurocephalites icosidactylus*. *Staurocephalites dentatus* Stauffer (1933) has the same general shape and similar minute posterior denticles but differs in other ways. There is a general resemblance in shape and in the presence of minute posterior denticles between *Staurocephalites appositus* Eller (1945) and *Staurocephalites icosidactylus*. Locality: St. Mary's, Ontario.

*Staurocephalites fraternus* sp. nov.

Maxilla I. Plate 5, Fig. 8

The jaw is elongate and the figured specimen measures 0.71 mm. in length and about 0.21 mm. in width. Along the inner margin a series of 13 triangular, sharp-pointed, backward-directed denticles extends to the posterior end. The first denticle is slightly larger and appears, when viewed from the side, to be a continuation of the margins. The next seven denticles are nearly uniform in size and the remaining four or five are small and also nearly uniform in size. The anterior margin is straight and oblique to the lateral

margins while the posterior end is rounded. A narrow, deep fossa extends the full length of the jaw. One margin is thickened and rounded while the other is thin and broken. The area between the thickened margin and the denticles is slightly concave.

There is a general resemblance of *Staurocephalites fraternus* to other forms of the genus. Adhering to this jaw at the anterior end is a small cone-shaped denticle that can be allied to this form as a maxilla IV or V. Locality: Cheap-side, Ontario.

*Staurocephalites fractus* sp. nov.

Maxilla I. Plate 5, Fig. 9, 10

In outline the jaw is elongate and probably narrow. The margins of the specimens are mostly broken. The figured specimens measure 0.55 mm. and 0.61 mm. in length and about 0.16 mm. and 0.13 mm. in width. Along the inner margin a series of 11 to 13 conical, sharp-pointed, backward-directed denticles extends nearly to the blunt or rounded posterior extremity. The first denticle is large and forms a sharp angle with the acute anterior end. The second denticle is small and is followed by larger teeth that decrease in size very little to the posterior end of the jaw. A narrow, deep fossa extends the full length of the jaw. The margins of the fossa are usually frail or broken. Both surfaces of the jaw are slightly concave.

While similar in a general way to other forms of *Staurocephalites*, the position of the anterior margin with the first denticle is different from other species. Locality: Delaware, Ohio.

*Staurocephalites longirostris* sp. nov.

Maxilla I. Plate 5, Fig. 11, 12

In size the jaw is wide in proportion to the length. The figured specimens measure 0.80 mm. and 0.88 mm. in length and 0.25 mm. and 0.26 mm. in width. Along the inner margin a series of 13 or 14 conical, sharp-pointed, backward-directed denticles extends to a point some distance from the posterior end of the jaw. The first denticle is large and beak-like and appears to be part of the margin. The remaining denticles are slightly smaller and decrease gradually to the posterior. The anterior end of the jaw is extended to a high peak while the posterior end is rounded. A narrow, deep fossa extends the full length of the jaw. One margin of the fossa is thin and usually partly missing. The sides of the jaw are flattened or slightly concave. A secondary jaw or row of denticles is present that appears to be a margin of the fossa. It is probably a maxilla II or III in which the articulation cannot be readily detected. The secondary jaw consists of about 13 small, triangular, sharp-pointed, backward-directed denticles. They are fairly uniform in size and extend about three-fourths the length of the larger jaw.

There is a similarity between *Staurocephalites longirostris* and *Staurocephalites alterostris* Eller (1955) and *Staurocephalites aequilateralis* Eller (1955) in general shape and especially in the arrangement of the secondary jaw. The forms differ in details and the denticles are unlike in size, shape, and arrangement. Locality: Goderich, Ontario.



*Staurocephalites longus* sp. nov.

Maxilla I. Plate 5, Fig. 13, 15, 16

In shape the jaw is narrow and elongate. The figured specimens measure 0.68 mm. and 0.67 mm. in length and about 0.16 mm. and 0.17 mm. in width. A series of 16 or 17 triangular, sharp-pointed, mostly backward-directed denticles extends nearly the full length of the jaw. The first denticle is small but has a wide base. It is followed by two minute teeth. The next six or seven denticles are large. These are followed by several minute teeth that are spaced very close together. On one side the larger teeth continue as ridges and valleys halfway across the jaw. A deep, narrow fossa extends the full length of the jaw. The posterior end of the fossa is open. The margins of the fossa are thickened and rounded. The area between the margin of the fossa and the denticles is concave while the opposite side is convex. Both the anterior and posterior ends of the jaw are rounded.

*Staurocephalites longus* does not resemble very closely other forms. The minute posterior denticles are similar to those of several species. Locality: Goderich, Ontario.

*Staurocephalites insolens* sp. nov.

Maxilla I. Plate 5, Fig. 14

This species is represented by only one specimen. Even though the margins are broken it seems worth describing. The jaw is large and wide and the figured specimen measures 0.97 mm. in length and about 0.37 mm. in width. Along the inner margin a series of 13 triangular, sharp-pointed denticles extends nearly the full length of the jaw. The first denticle is not large. It is followed by four or five backward-directed teeth. The remaining denticles decrease to minute size at the posterior end. A deep, wide fossa extends the complete length of the jaw. The margins of the fossa are thin and broken. Both the anterior and posterior ends of the jaw are blunt or rounded. The sides of the jaw are irregularly convex and concave. A small secondary jaw, a maxilla III or IV, is present in the posterior area. The jaw has seven denticles of irregular size and shape. It is questionable whether this jaw is in articulation with the maxilla I.

There is a similarity between *Staurocephalites longus*, Plate 5, Fig. 13, 15, 16 and *Staurocephalites insolens*. They differ in the proportions of the length to the width. Locality: Delaware, Ohio.

*Staurocephalites* sp. indet.

Maxilla I. Plate 5, Fig. 17

Since only one broken specimen of this form was found specific identification will not be attempted. Locality: Bloomfield, Ohio.

*Staurocephalites inclinatus* sp. nov.

Maxilla I. Plate 5, Fig. 20

In shape the jaw is narrow, elongate and slightly bent. The figured specimen measures 0.62 mm. in length and 0.17 mm. in width. On the outer margin a series of 13 conical, sharp-pointed, backward-directed denticles ex-

tends nearly the full length of the jaw. The first two denticles are wider than the remaining teeth, which are narrow. Though the denticles are directed backward, they tend to be hooked slightly forward. The denticles are fairly uniform in size and become smaller only at the posterior end. A long, narrow fossa extends nearly the full length of the jaw. The anterior end of the jaw is rounded, while the posterior extremity is sharply pointed.

This form does not correspond very closely with other species. Locality: Cheapside, Ontario.

*Staurocephalites* sp. indet.

Maxilla I. Plate 5, Fig. 21

This form is represented by one broken specimen. The part of the margin adjacent to the denticles appears not to be broken. The space between the denticles and this margin would thus be very narrow and the fossa very wide. The first denticle, when observed from the under side, is large and seems to be a continuation of the anterior margin. Locality: Bloomfield, Ohio.

Genus DIOPATRAITES Eller, 1938

*Diopatraites liratus* sp. nov.

Mandible. Plate 5, Fig. 22

The right mandible is short, angular, and measures 0.51 mm. in length. Three angular, irregularly shaped teeth occupy the anterior margin of the large frontal plate. From the outer side the teeth decrease in size to the inner side. The teeth seem to continue as ridges and furrows halfway across the frontal plate. The shaft is short, wide anteriorly, and tapering to a blunt posterior end. The outer margin of the shaft is straight, with a broad angle at about the midpoint. The inner margin begins in a straight manner but incurves near the mid-area. The upper surface of the shaft is rounded, while the under surface is concave.

*Diopatraites liratus* does not correspond very closely with other forms. Locality: Goderich, Ontario.

*Diopatraites ischypus* sp. nov.

Mandible. Plate 5, Fig. 23

The mandible is narrow and elongate and has the appearance of a strong foot. The figured specimen is broken but would probably measure 0.80 mm. in length. A large, angular, smooth, slightly concave frontal plate is subrectangular in shape. Except for the anterior end the margins of the plate are incurved. Along the anterior margin is a series of eight conical, sharp-pointed teeth. The first tooth, beginning at the outer side, is minute. It is followed by a large tooth. The third tooth is again minute. The remaining teeth are large and decrease in size gradually to the inner side of the jaw. The shaft is long with straight margins. The upper surface of the shaft is angular and the under side is concave.

*Diopatraites ischypus* resembles other forms of the genus only in a general way. Locality: Cheapside, Ontario.

## Genus ORTHOPELTA Eisenack, 1939

*Orthopelta* ? *humerus* sp. nov.

Carrier. Plate 5, Fig. 25, 26

The carriers are short and wide and the figured specimen measures 0.35 mm. in length. At the anterior end the carrier is wide and flattened and in the center is a small knob-like projection. This area is suitable for articulating with the posterior end of a maxilla I. The outside margins of the short shafts are curved while the inner margins are slightly incurved. At the widened posterior end are three knob-like projections. The surfaces are irregularly concave and convex.

*Orthopelta* ? *humerus* cannot be compared closely to any other form. *Orthopelta* ? *femoralis* Eller (1945) has a triformed end similar to *Orthopelta* ? *humerus*. Locality: Goderich, Ontario.

## Genus MARPHYSAITES Eller, 1945

*Marphysaites* sp. indet.

Carrier? Plate 5, Fig. 27

Since the posterior end of the carrier is missing specific identification will not be attempted. At the posterior end where the carrier is broken the margins flair out slightly. The anterior margin and part of the outer margin are thickened. Adjacent to the margins the carrier is concave. Locality: Goderich, Ontario.

*Marphysaites junctus* sp. nov.

Carrier? Plate 5, Fig. 28

The carriers are narrow and elongate. The figured specimens measure 0.61 mm. in length and 0.15 mm. in width. From the blunt, articulating or connecting anterior end the carriers incurve slightly and decrease in width gradually to the acute posterior end. The upper surface of the carrier is convex while the under surface is slightly concave.

*Marphysaites aptus* Eller (1945) was described as a mandible, based on its resemblance to species of the modern genus *Marphysa* Savigny. It seems possible, however, that these structures may be carriers. The anterior margin could well be the articulating surface of a Maxilla I. Some species of the modern genus *Leodice* Savigny have carriers not too unlike *Marphysaites junctus*. Locality: Cheapside, Ontario.

*Marphysaites gomphoides* sp. nov.

Carrier? Plate 5, Fig. 29, 30

In size the carriers are very large. The figured specimen measures 0.88 mm. in length and 0.37 mm. at the anterior end. It is rather difficult to tell which is the upper and which the under side of the carrier. At the anterior end, if the carriers are oriented correctly, there is a wide, rounded, flattened or slightly concave area that extends beyond the incurved inner margin. This is perhaps the upper side of the right carrier and a similar structure of the left carrier would articulate on this area. The anterior end is rounded and

club-like, while the posterior end is blunt. The sides of the carrier are nearly straight and they do not decrease in width posteriorly.

*Marphysaites gomphoides* does not correspond very closely to any other form. Locality: Goderich, Ontario.

#### Genus SILUOPELTA Eller, 1939

##### *Siluropelta jaculus* sp. nov.

Mandible. Plate 5, Fig. 31

The mandible is narrow and elongate. The figured specimen measures 0.65 mm. in length and about 0.19 mm. in width at the anterior end. The inner and outer margins are nearly straight and terminate in an acute posterior extremity. At the anterior the margin curves to form a short, blunt, slightly-hooked shaft. The mandible is flat or convex on the upper surface and slightly concave on the under side.

*Siluropelta jaculus*, because of the narrow posterior, is unlike other forms of the genus. Locality: St. Mary's, Ontario.

##### *Siluropelta laeviculus* sp. nov.

Mandible. Plate 5, Fig. 32, 33

In shape the mandible is wide and not elongate. The figured specimen measures 0.60 mm. in length and 0.24 mm. in width at the widest place. The inner margin is straight except at the posterior end where it incurves slightly. The outer margin curves broadly and terminates with the inner margin in an acute posterior end. The anterior margin incurves slightly to form a short, slightly-hooked shaft or spine. The under side is flat or nearly smooth except near the inner margin where it becomes slightly concave. Except for a flattened area at the outer margin the upper side is convex.

*Siluropelta laeviculus* is unlike other forms due to the shortness of the shaft and the acute posterior. Locality: St. Mary's, Ontario.

##### *Siluropelta accommodus* ? (Eller)

Mandible. Plate 5, Fig. 34

*Diopatraites accommodus* Eller, 1955. Annals of the Carnegie Museum, v. 33, p. 371, Pl. 26, Fig. 21.

The figured specimen measures 0.98 mm. in length and about 0.27 mm. in width. There is a close resemblance between this form and *Diopatraites accommodus* Eller (1955). Both have the same appearance and outline. They differ mostly in width, angularity and robustness. Locality: Cheapside, Ontario.

#### Genus CHITINODENDRON ? Eisenack

##### *Chitinodendron* ? sp.

Plate 5, Fig. 24

At a number of localities in the Delaware limestone chitinous-like bladder-shaped objects were found in the residues. Eisenack (1937) figured a number of forms from the Silurian of the Baltic region that resemble these Devonian



specimens in a general way. Most of the Delaware specimens are very uniform in shape and size. All of the specimens have irregular surfaces and a crushed appearance due to the apparent thinness of the walls. An average specimen measures about 0.72 mm. in length, not counting the tube, and about 0.30 mm. in width. Attached to the end or ends of the form is a tube-like projection. It is wide at the base but narrows rapidly. Several specimens bore a thread-like tubular connection or projection about 0.30 mm. long. One was bifurcate. In most specimens the tube was broken off close to the body of the form. A few specimens had short tubular projections at both ends. A few flattened, thread-like tubular objects were noted in the residue but not proportionate to the bladder-shaped objects. Since the material was collected on sieves not finer than one hundred mesh it is possible that most of them were lost. These residues contained many strange and interesting objects, but since the main interest in the material was scolecodonts not much attention was given to other forms. The genus *Chitinodendron*, as far as has been determined, has not been reported before in North America. Locality: Goderich, Ontario.

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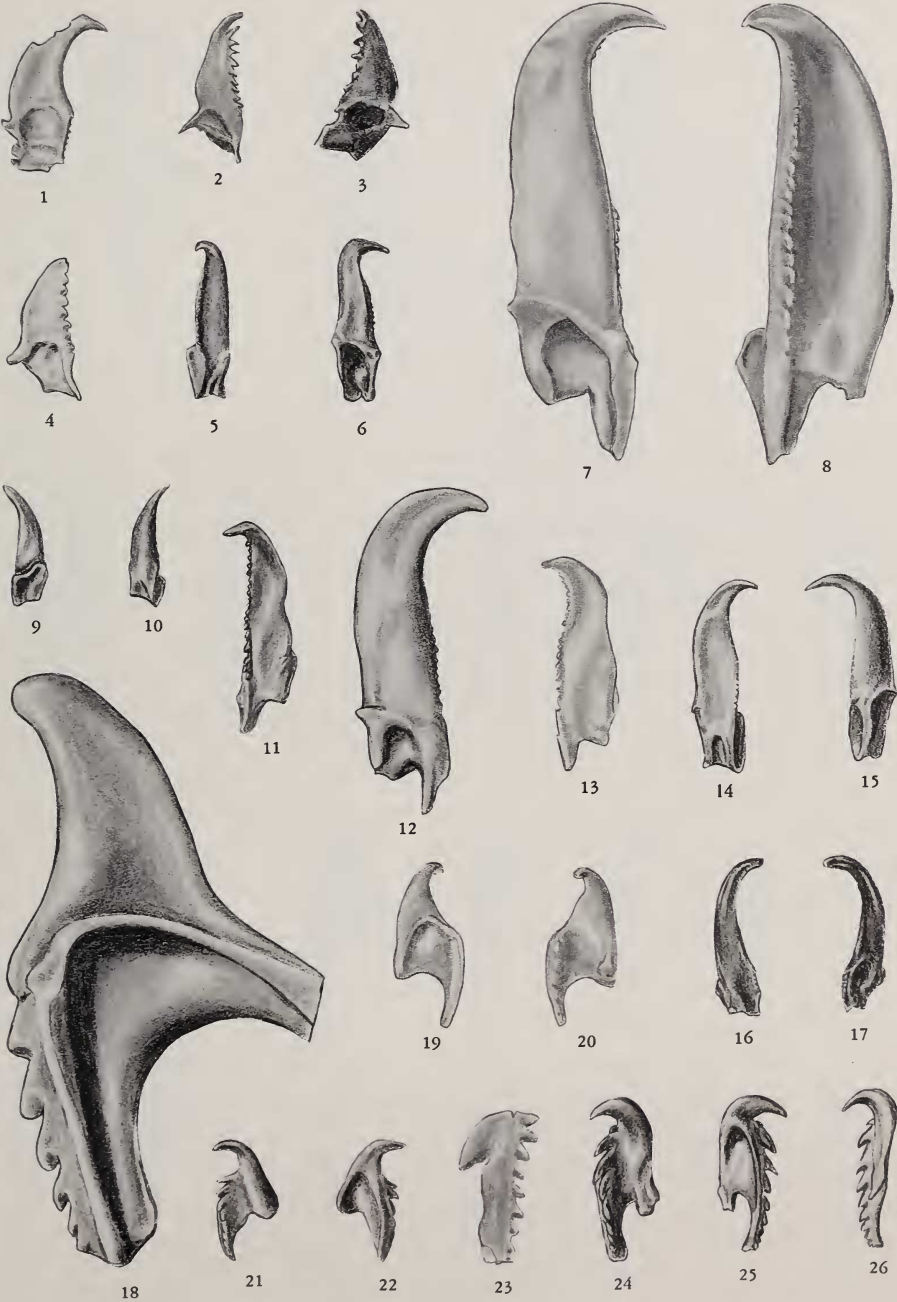
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## EXPLANATION OF PLATE 1

Figures magnified about 28 times.

Numbers in parentheses indicate Carnegie Museum catalogue numbers of the respective type specimens.

- |                       |   |
|-----------------------|---|
| Fig. 1                | <i>Arabellites goniocerus</i> sp. nov.<br>Maxilla I (28734)               |
| Fig. 2, 3, 4          | <i>Arabellites comis</i> Eller<br>Maxilla I (28737, 28744)                |
| Fig. 5, 6             | <i>Nereidavus forcicarinatus</i> sp. nov.<br>Maxilla I (28755)            |
| Fig. 7, 8, 11, 12, 13 | <i>Nereidavus incrassatus</i> sp. nov.<br>Maxilla I (28758, 28759, 28760) |
| Fig. 9, 10            | <i>Nereidavus hastatus</i> sp. nov.<br>Maxilla I (28766)                  |
| Fig. 14, 15           | <i>Nereidavus incomptus</i> sp. nov.<br>Maxilla I (28767)                 |
| Fig. 16, 17           | <i>Drilonereisites gracillimus</i> sp. nov.<br>Maxilla I (28952)          |
| Fig. 18               | <i>Ildraites incredibilis</i> sp. nov.<br>Maxilla I (28777)               |
| Fig. 19, 20           | <i>Ildraites insignis</i> sp. nov.<br>Maxilla I (28778)                   |
| Fig. 21, 22           | <i>Ildraites invalidus</i> sp. nov.<br>Maxilla I (28779)                  |
| Fig. 23               | <i>Leodicites</i> sp. indet.<br>Maxilla II (28954)                        |
| Fig. 24, 25, 26       | <i>Ildraites unexpectatus</i> sp. nov.<br>Maxilla I (28782)               |



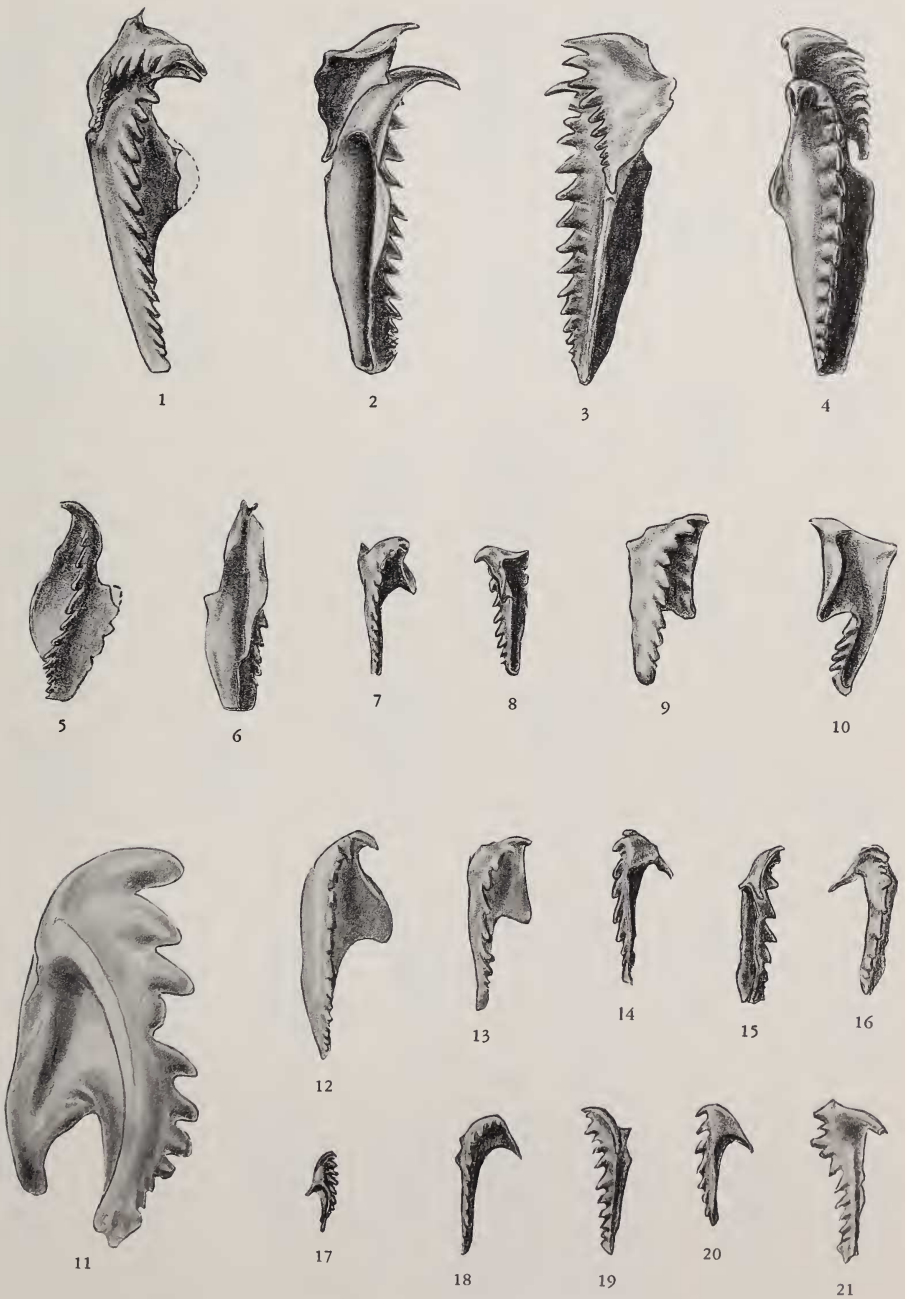
## EXPLANATION OF PLATE 2

Figures magnified about 28 times.

Numbers in parentheses indicate Carnegie Museum catalogue numbers of the respective type specimens.

- |                     |   |
|---------------------|---|
| Fig. 1, 2, 3, 4, 12 | <i>Lumbriconereites jugosus</i> sp. nov.<br>Maxilla I (28801, 28802)  |
| Fig. 5, 6           | <i>Lumbriconereites labiosus</i> sp. nov.<br>Maxilla I (28812, 28813) |
| Fig. 7, 8           | <i>Lumbriconereites flexuosus</i> sp. nov.<br>Maxilla I (28814)       |
| Fig. 9, 10, 13      | <i>Lumbriconereites latifrons</i> sp. nov.<br>Maxilla I (28816)       |
| Fig. 11             | <i>Leodicites fluctuosus</i> sp. nov.<br>Maxilla II (28821)           |
| Fig. 14, 15, 16, 21 | <i>Leodicites inordinatus</i> sp. nov.<br>Maxilla II (28822, 28823)   |
| Fig. 17             | <i>Leodicites inornatus</i> sp. nov.<br>Maxilla II (28824)            |
| Fig. 18, 19         | <i>Leodicites finitimus</i> sp. nov.<br>Maxilla II (28825)            |
| Fig. 20             | <i>Leodicites heteropsis</i> sp. nov.<br>Maxilla II (28829)           |





## EXPLANATION OF PLATE 3

Figures magnified about 28 times.

Numbers in parentheses indicate Carnegie Museum catalogue numbers of the respective type specimens.

- Fig. 1, 2, 3, 4     *Drilonereisites longicusculus* sp. nov.  
Maxilla I (28950, 28951)
- Fig. 5, 6, 7     *Leodicites incertus* sp. nov.  
Maxilla II (28830)
- Fig. 8     *Paleoenonites latidorsatus* sp. nov.  
Maxilla II (28841)
- Fig. 9, 19, 26, 27     *Paleoenonites informis* sp. nov.  
Maxilla II (28842, 28843, 28844, 28845)
- Fig. 10     *Paleoenonites incurvus* sp. nov.  
Maxilla II (28846)
- Fig. 11     *Paleoenonites latissimus* sp. nov.  
Maxilla II (28847)
- Fig. 12     *Paleoenonites hiulcus* sp. nov.  
Maxilla II (28848)
- Fig. 13     *Leodicites inflatus* sp. nov.  
Maxilla II (28832)
- Fig. 14, 15     *Paleoenonites lacinatus* sp. nov.  
Maxilla II (28849)
- Fig. 16, 17     *Paleoenonites lacertosus* sp. nov.  
Maxilla II (28855)
- Fig. 18     *Paleoenonites flaccidus* sp. nov.  
Maxilla II (28856)
- Fig. 20     *Leodicites indecorus* sp. nov.  
Maxilla II (28831)
- Fig. 21     *Paleoenonites hexadactylus* sp. nov.  
Maxilla II (28857)
- Fig. 22, 23     *Paleoenonites latimarginatus* sp. nov.  
Maxilla II (28858)
- Fig. 24, 25     *Paleoenonites geometricus* sp. nov.  
Maxilla II (28859)
- Fig. 28     *Paleoenonites inops* sp. nov.  
Maxilla II (28860)
- Fig. 29, 30, 34     *Paleoenonites* sp.  
Maxilla II (28861, 28862)
- Fig. 31, 32     *Paleoenonites insperatus* sp. nov.  
Maxilla II (28863)
- Fig. 33     *Paleoenonites lituus* sp. nov.  
Maxilla II (28864)
- Fig. 35, 36     *Paleoenonites indentus* sp. nov.  
Maxilla II (28866)
- Fig. 37     *Paleoenonites limulurus* sp. nov.  
Maxilla II (28868)
- Fig. 38, 39     *Paleoenonites formosus* sp. nov.  
Maxilla II (28869)
- Fig. 40, 41, 42     *Paleoenonites flexuosus* sp. nov.  
Maxilla II (28871)

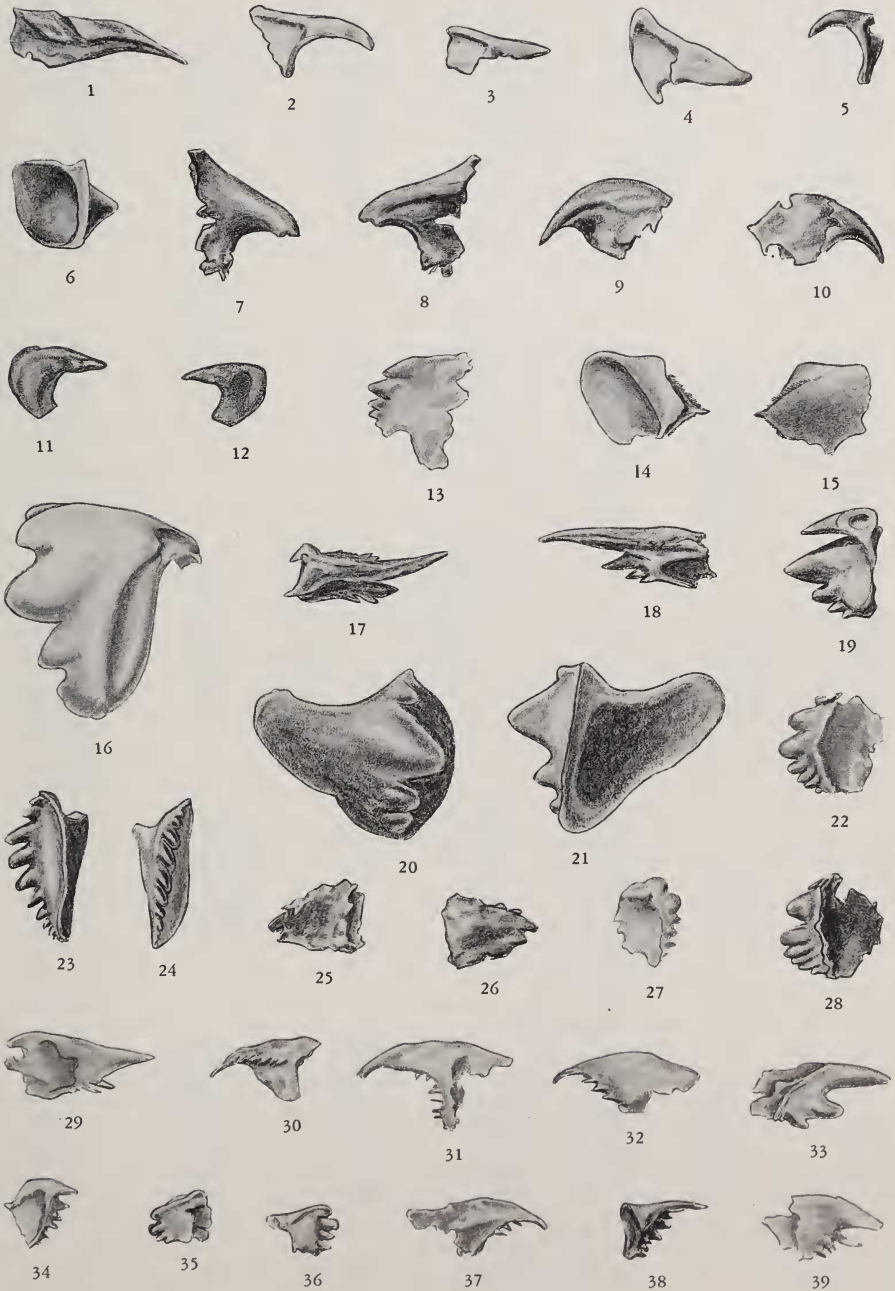


## EXPLANATION OF PLATE 4

Figures magnified about 28 times.

Numbers in parentheses indicate Carnegie Museum catalogue numbers of the respective type specimens.

- Fig. 1 *Eunicites lanceolatus* sp. nov.  
Maxilla IV or V (28878)
- Fig. 2 *Eunicites admirandus* sp. nov.  
Maxilla IV or V (28879)
- Fig. 3 *Eunicites* sp.  
Maxilla IV or V (28880)
- Fig. 4 *Eunicites florealis* sp. nov.  
Maxilla IV or V (28881)
- Fig. 5 *Eunicites hemicyclus* sp. nov.  
Maxilla IV or V (28882)
- Fig. 6 *Eunicites ambocoelius* Eller  
Maxilla IV or V (28883)
- Fig. 7, 8 *Eunicites apicalis* ? Eller  
Maxilla IV or V (28884)
- Fig. 9, 10 *Eunicites asaphus* ? Eller  
Maxilla IV or V (28885)
- Fig. 11, 12 *Eunicites limbatus* sp. nov.  
Maxilla IV or V (28886)
- Fig. 13 *Anisocerasites* sp. indet.  
Maxilla III (28889)
- Fig. 14, 15 *Eunicites fimbriatus* sp. nov.  
Maxilla IV or V (28887)
- Fig. 16 *Anisocerasites insignis* sp. nov.  
Maxilla III (28891)
- Fig. 17, 18 *Anisocerasites longidactylus* sp. nov.  
Maxilla III (28892)
- Fig. 19 *Anisocerasites* sp. indet.  
Maxilla III (28893)
- Fig. 20, 21 *Anisocerasites gigas* sp. nov.  
Maxilla III (28894)
- Fig. 22, 27, 28 *Anisocerasites globosus* sp. nov.  
Maxilla III (28896, 28897, 28898)
- Fig. 23, 24 *Anisocerasites feroculus* sp. nov.  
Maxilla III (28902)
- Fig. 25, 26 *Anisocerasites* sp. indet.  
Maxilla III (28903)
- Fig. 29 *Ungulites indigestus* sp. nov.  
Maxilla III (28904)
- Fig. 30 *Ungulites fusus* sp. nov.  
Maxilla III (28905)
- Fig. 31 *Ungulites* sp. indet.  
Maxilla III (28906)
- Fig. 32, 37 *Ungulites glyptus* sp. nov.  
Maxilla III (28907)
- Fig. 33 *Ungulites* sp. indet.  
Maxilla III (28953)
- Fig. 34 *Leodicites lacunosus* sp. nov.  
Maxilla III (28834)
- Fig. 35, 36 *Anisocerasites* sp. indet.  
Maxilla IV (28910)
- Fig. 38 *Ungulites lupatus* sp. nov.  
Maxilla III (28911)
- Fig. 39 *Ungulites* sp. indet.  
Maxilla III (28912)





## EXPLANATION OF PLATE 5

Figures magnified about 28 times.

Numbers in parentheses indicate Carnegie Museum catalogue numbers of the respective type specimens.

- Fig. 1, 2            *Staurocephalites alterostris* Eller  
Maxilla I (28913, 28914)
- Fig. 3, 4            *Staurocephalites latibrachiatius* sp. nov.  
Maxilla I (28921)
- Fig. 5, 6            *Staurocephalites liratus* sp. nov.  
Maxilla I (28923)
- Fig. 7              *Staurocephalites icosidactylus* sp. nov.  
Maxilla I (28925)
- Fig. 8              *Staurocephalites fraternus* sp. nov.  
Maxilla I (28926)
- Fig. 9, 10          *Staurocephalites fractus* sp. nov.  
Maxilla I (28927, 28928)
- Fig. 11, 12        *Staurocephalites longirostris* sp. nov.  
Maxilla I (28929)
- Fig. 13, 15, 16    *Staurocephalites longus* sp. nov.  
Maxilla I (28932)
- Fig. 14            *Staurocephalites insolens* sp. nov.  
Maxilla I (28933)
- Fig. 17            *Staurocephalites* sp. indet.  
Maxilla I (28934)
- Fig. 18, 19        *Leodicites lamellosus* sp. nov.  
Maxilla II (28835)
- Fig. 20            *Staurocephalites inclinatus* sp. nov.  
Maxilla I (28936)
- Fig. 21            *Staurocephalites* sp. indet.  
Maxilla I (28937)
- Fig. 22            *Diopatraites liratus* sp. nov.  
Mandible (28938)
- Fig. 23            *Diopatraites ischypus* sp. nov.  
Mandible (28939)
- Fig. 24            *Chitinodendron* ? sp.  
(28956)
- Fig. 25, 26        *Orthopelta* ? *humerus* sp. nov.  
Carrier (28941)
- Fig. 27            *Marphysaites* sp. indet.  
Carrier? (28942)
- Fig. 28            *Marphysaites junctus* sp. nov.  
Carrier? (28943)
- Fig. 29, 30        *Marphysaites gomphoides* sp. nov.  
Carrier? (28944)
- Fig. 31            *Siluropelta jaculus* sp. nov.  
Mandible (28945)
- Fig. 32, 33        *Siluropelta laeviculus* sp. nov.  
Mandible (28946)
- Fig. 34            *Siluropelta accommodus* ? (Eller)  
Mandible (28949)

